

# **Exhibit 1**

December 21, 2020

**VIA Email**

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Attn: Puerto Rico Utilities PEA Public Comments  
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**RE: Comments Objecting to the Approval of the Programmatic Environmental Assessment: Utility Repair, Replacement, and Realignment, Commonwealth of Puerto Rico, DR-4339-PR.**

Dear Messrs. Von Essen and Baquero Tirado:

Comité Diálogo Ambiental, Inc. (“CDA”), El Puente de Williamsburg, Inc. – Enlace Latino de Acción Climática (“El Puente – ELAC”), Comité Yabucoño Pro-Calidad de Vida, Inc. (“YUCAE”), Alianza Comunitaria Ambientalista del Sureste, Inc. (“ACASE”), Sierra Club Puerto Rico, Inc. (“Sierra Club PR”), Mayagüezanos por la Salud y el Ambiente, Inc. (“MSA”), Coalición de Organizaciones Anti Incineración, Inc. (“COAI”), Amigos del Río Guaynabo, Inc. (“ARG”), Campamento Contra las Cenizas en Peñuelas, Inc., and Cambio, PR, Inc., collectively known as Alianza de Energía Renovable Ahora (“AERA”) submit these comments to the Federal Emergency Management Agency (“FEMA”) Draft Programmatic Environmental Assessment: Utility Repair, Replacement, and Realignment in the Commonwealth of Puerto Rico, DR-4339-PR (“PEA”).

We submit these comments to the Draft FEMA PEA to raise concerns about the inadequacies of the PEA, the failure to address safety issues, risks, and significant adverse environmental impacts and repercussions of not preparing an Environmental Impact Assessment. The FEMA funds for which the PEA is proposed represent an opportunity to provide a lifeline to residents and businesses in Puerto Rico, especially low- and medium-income (“LMI”) communities. The comments are based on many years of work on energy issues in Puerto Rico.

## **BACKGROUND**

### *The vulnerabilities and public health risks of the existing electric system*

Hurricanes Irma and Maria demonstrated that the transmission and distribution (“T&D”) system that carries power from the large, centralized power plants, especially the plants in Southern Puerto Rico to the North are a key vulnerability of the Puerto Rico electric system. Moreover, the South-to-North transmission system is vulnerable to multiple types of weather events, earthquakes, vegetation growth, wildlife impacts, lack of investment in maintenance, difficult access to servitudes and easements, among others. As a matter of basic physics, the T&D’s interconnected vertical structures, will likely succumb in the next hurricane(s) even if “hardened”.

The centralized configuration and heavy dependence on South-to-North transmission in the path of hurricanes that usually make landfall in Eastern Puerto Rico and cut across the Island from east to west increases the risks of power outages. After previous hurricanes, like Hugo in 1989, Hortensia in 1996, George in 1998, when the network was presumably strong and the required maintenance was done, electricity outages lasted months because a failure in one part of the centralized grid triggered interruptions in other parts of the system and sometimes complete outages.

This year’s seismic events further demonstrated and alerted to the vulnerability of large, centralized plants and the affiliated transmission system: The Costa Sur and EcoElectrica plants in Southwestern Puerto Rico were both damaged by the earthquakes and aftershocks. Furthermore, the U.S. Geological Survey has determined that the areas where the San Juan and Palo Seco plants are located are at high risk of liquefaction in the event of earthquakes.<sup>1</sup> The Great Southern Puerto Rico Fault Zone runs through the Jobos Bay area where the Aguirre Power Complex and the Applied Energy System (“AES”) Corporation AES coal burning power plants are located.<sup>2</sup>

Much of the existing energy infrastructure is in flood prone areas or at risk of impacts from sea level rise, storm surge, tsunamis or other flooding risks to the plants and T&D infrastructure. The Palo Seco plant, depot and accompanying infrastructure are in a tsunami flood area.<sup>3</sup>

The operation of all fossil fuel plants in Puerto Rico emit multiple contaminants that adversely impact public health and the environment. The AES coal-fired power plant and the

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<sup>1</sup> Jeffrey L. Bachhuber, James V. Hengesh, & Sean T. Sunderman, *Liquefaction Susceptibility of the Bayamon and San Juan Quadrangles, Puerto Rico*, at 30, Figure 6, (2008), [https://earthquake.usgs.gov/cfusion/external\\_grants/reports/03HQGR0107.pdf](https://earthquake.usgs.gov/cfusion/external_grants/reports/03HQGR0107.pdf) (noting very high susceptibility zones in areas along the Bayamon coastal plain, Bahia de San Juan, and Laguna San Jose); James V. Hengesh, & Jeffrey L. Bachhuber, *Liquefaction susceptibility zonation map of San Juan, Puerto Rico*, in Mann, P. (ed.), Active tectonics and seismic hazards of Puerto Rico, the Virgin Islands, and offshore areas: Geological Society of America Special Paper 385, at 249–262 (2005).

<sup>2</sup> *Id.* at 250.

<sup>3</sup> Cent. Off. for Recovery, Reconstruction and Resiliency, *The Grid Modernization of Puerto Rico* at 107, Figure 6-6 (“Map of Palo Seco Plant and Depot in Flood Area,” listing PREPA as the source of this information).

Aguirre Power Complex located in Southeastern Puerto Rico are the two primary sources of air pollution and toxic emissions in the archipelago<sup>4</sup> and disproportionately impact some of the poorest communities. These two plants also extract large amounts of freshwater from the South Coast Aquifer and have contributed to the water scarcity that led to water rationing in summer 2019 and in previous years.<sup>5</sup>

The Costa Sur and EcoElectrica plants in Southwestern Puerto Rico both burn imported Liquified Natural Gas (“LNG”, liquified methane gas) and also transmit energy long distance using the vulnerable T&D system.

Except for the renewable energy facilities on the eastern coast of Puerto Rico, where Hurricane Maria made landfall, solar installations withstood the hurricane force winds. However, utility-scale, land-based renewable installations that depend on the vulnerable T&D system were unable to transmit power to where it was needed. Some higher-income Puerto Rico residents and businesses have installed photovoltaic systems and/or energy storage equipment on their rooftops or onsite to supply at least part of their energy needs and provide resilience. However, the upfront investments and/or high leasing costs have prevented widespread uptake of rooftop or onsite solar and storage.

**The FEMA funds should support efforts to incentivize the Puerto Rico Electric Power Authority (“PREPA”) to acquire photovoltaic (“PV”) and Battery Energy Storage Systems (“BESS”) to be installed by its trained workforce in conjunction with local contractors and organized communities.** Widespread onsite solar installations could subsequently provide the path to rooftop solar communities that operate as microgrids with the ability to connect and disconnect from the main grid along with energy demand management and efficiency programs and the other alternatives discussed in these comments.

Given the economic crisis in Puerto Rico, available resources, such as the FEMA funds should be invested in options that save lives, promote local economic development, and change the trajectory of exporting billions of dollars per year for fossil fuels and power purchase payments to maintain a stagnant system. Moreover, the funds present a once-in-a-lifetime opportunity to

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<sup>4</sup> U.S. Envtl. Prot. Agency, 2018 Toxic Release Inventory (TRI) Factsheet: State – Puerto Rico (Nov. 12, 2019), [https://enviro.epa.gov/triexplorer/tri\\_factsheet.factsheet\\_forstate?pZip=&pParent=NAT&pCity=&pCounty=&pState=PR&pYear=2018&pDataSet=TRIQ1&pPrint=0](https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet_forstate?pZip=&pParent=NAT&pCity=&pCounty=&pState=PR&pYear=2018&pDataSet=TRIQ1&pPrint=0).

<sup>5</sup> See, e.g., Puerto Rico Departamento de Recursos Naturales, Orden Administrativa 2016 - 018 Para Declarar como Área Crítica los Acuíferos del Sur de los Municipios de Ponce, Juana Díaz, Santa Isabel, Salinas, Guayama, y Arroyo (June 28, 2016), <http://www.drna.pr.gov/documentos/orden-administrativa-2016-018-para-declarar-como-area-critica-los-acuiferos-del-sur-de-los-municipios-de-ponce-juana-diaz-santa-isabel-salinas-guayama-y-arroyo/>; Jason Rodriguez Grafal, Acuífero del Sur: Retrocede la única fuente de agua potable de 30 mil sureños, La Perla del Sur (May 29, 2019), <https://www.periodicolaperla.com/acuifero-del-sur-retrocede-la-unica-fuente-de-agua-potable-de-30-mil-sureños1/>; U.S. Geol. Survey, USGS Water Use Data for Puerto Rico, <https://waterdata.usgs.gov/pr/nwis/wu> (last visited Mar. 5, 2020); Franquicia para el uso y aprovechamiento de aguas de AES-RO-06-10-99-PFI-70380

reduce electric system vulnerability with onsite/rooftop solar plus storage and provide a lifeline to Puerto Rico residents.

## **VIABLE ALTERNATIVES FOR LIFE-SAVING ELECTRIC SERVICE NOT CONSIDERED IN THE PEA**

The commenters promote alternatives to central station, fossil fuel generation including the following options:

1. Energy efficiency and conservation measures;
2. Energy storage for rooftop or onsite solar photovoltaic (PV) installations;
3. Solar installations at schools, water purification and treatment plants, parking lots and similar areas;
4. Energy demand management programs that incorporate time of use incentives to address the nighttime peak and other demand response options;
5. Rooftop or onsite PV installations and solar communities as recommended in studies by the University of Puerto Rico at Mayaguez faculty.<sup>6</sup>

Numerous civil society groups, including community, environmental, labor, professional organizations and academia co-founded and endorse the Queremos Sol Proposal (“We Want Sun”, [www.queremossolpr.com](http://www.queremossolpr.com)) which promotes the transformation of PREPA to achieve a life-sustaining, renewable energy electric system. Reliable electric service is required to power life-sustaining medical equipment and medications. Studies have documented that the power failure after hurricane Maria led to thousands of deaths.<sup>7</sup> Queremos Sol proposes widespread adoption of rooftop solar + storage and is largely consistent with the Puerto Rico’s legally mandated Renewable Portfolio Standard (RPS) to achieve 20% renewable energy by 2022, 40% by 2025, 60% by 2040 and 100% renewable energy by 2050.

Studies commissioned by the Puerto Rico Energy Bureau (“PREB”) project that new solar generation will cost about 6.7 cents / kWh.<sup>8</sup> Furthermore, rooftop solar + storage systems have low interconnection costs and system impacts. In order to achieve the legally mandated renewable energy goals, Puerto Rico must attain a minimum of 3,750 MW of renewables and 1,500 MW of storage by August 2025 according to the Integrated Resource Plan (“IRP”) recently approved by PREB.<sup>9</sup>

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<sup>6</sup> Instituto Tropical de Energía, Ambiente y Sociedad, [http://www.uprm.edu/aret/docs/Ch\\_1\\_Summary.pdf](http://www.uprm.edu/aret/docs/Ch_1_Summary.pdf), p. 1-13,1-14.

<sup>7</sup> Tom Dreisbach, Problems With Health Care Contributed To Hurricane Maria Death Toll In Puerto Rico (2009), <https://www.npr.org/2019/02/21/696769824/problems-with-health-care-contributed-to-hurricane-maria-death-toll-in-puerto-rico>, (last visited Dec. 17, 2020).

<sup>8</sup> Puerto Rico Energy Bureau, Appendix A -Report on the Cost Allocation Methods and Unbundling Issues for Puerto Rico, at 61, In Re: Unbundling of the Assets of the Puerto Rico Electric Power Authority, PREB Dkt. NEPR -AP-2018-0004 (Sept. 4, 2020).

<sup>9</sup> Puerto Rico Energy Bureau, Final Resolution and Order on the Puerto Rico Electric Power Authority’s Integrated Resource Plan, PREB Dkt. No. CEPR-AP-2018-0001, (Aug. 24, 2020). (Hereinafter, “Final Resolution and Order”)

Dozens of PREPA employees are trained to implement net metering and to install and maintain rooftop solar + storage systems. These employees have completed coursework on net metering and design and installation of rooftop solar + storage systems, offered through PREPA's Commercial Operations Training Center ("CAOC") and Electrical System Training Center ("CASE").<sup>10</sup> Employees trained through this program could install, and maintain rooftop solar + storage systems, work to interconnect the massive backlog of rooftop solar + storage systems in the interconnection queue, and implement *Comunicado Técnico* 19-02, which would allow for automatic interconnection of rooftop systems.<sup>11</sup>

PREPA installations could be done in conjunction with local renewable energy contractors and organized community groups. When the next storm strikes Puerto Rico, these efforts would allow rooftop solar + storage systems to power microgrids for hospitals and other critical infrastructure. The advantages of enlisting PREPA to implement a rooftop or onsite solar program is that the utility already has the service relationship with households and businesses such that transaction costs and wait times can be minimized. Through PREPA, residents in the lowest income strata can access renewable energy and storage technologies. Installations by the public utility will allow for mitigation of the most risk for the highest number of beneficiaries possible.

#### *A. Energy conservation, efficiency, customer engagement and demand response programs*

The Queremos Sol proposal highlights the importance of energy conservation, efficiency, customer engagement, and demand response programs. During the IRP technical hearings, expert witnesses identified several cost-effective Quick-Start Energy Efficiency programs such as solar water heaters, energy efficient refrigerator incentive programs, appliance replacement programs, tuning up air conditioners or replacing very old air conditioners, expanding the Office of Energy Public Policy's low-income weatherization program, to name a few.<sup>12</sup>

The IRP assumes that PREPA will comply with the 2% annual reduction in load due to energy efficiency as required by the Puerto Rico Energy Public Policy Act ("Law 17-2019"), culminating in a 30% reduction in PREPA's total load by 2040. Law 17-2019, Section 1.9(3)(B)

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<sup>10</sup> Partnership Committee Report, *Puerto Rico Public-Private Partnership for the Electric Power Transmission and Distribution System*, at 259 (2020). <https://aeepr.com/es-pr/QuienesSomos/Documents/Partnership%20Committee%20Report%20-Transmission%20and%20Distribution%20System.pdf>

CASE and CAOC offer hundreds of courses and eleven certifications, including numerous courses on renewables and distributed renewables. For example, CAOC courses teach about net metering. Engineer Javier Chaparro Echevarria, PREPA Mayagüez regional administrator, approved by the State Office of Public Energy Policy (OEPPE) to teach courses on installation of Renewable Electrical Systems and Wind Turbines. One of those courses is CASE 340: Design and Installation of Photovoltaic Systems. Engineer Chaparro has also taught courses with the Colegio de Ingenieros de Puerto Rico (Puerto Rico Engineering Association).

<sup>11</sup> As envisioned by the Final Resolution and Order, paras. 78, 83, <https://energia.pr.gov/wp-content/uploads/sites/7/2020/08/AP20180001-IRP-Final-Resolution-and-Order.pdf>.

<sup>12</sup> Negociado de Energía en vivo, Evidentiary Hearing / CEPR-AP-2018-0001, YouTube (Feb. 4, 2020), <https://youtu.be/-RXb0bf5ScY?t=13532>.

requires the IRP to include an evaluation of the conservation resources, including electricity demand management and the necessary programs to improve energy conservation. The Energy Bureau’s consultant highlighted that: the initial \$300M investment in energy efficiency would save \$1B in avoided generation costs over the planning period, and the next \$700M in energy efficiency spending would save an additional \$1.8B in avoided generation costs over the planning period.<sup>13</sup>

PREPA must coordinate with stakeholders in designing a customer engagement plan “to educate citizens and electric power service customers on energy efficiency, consumption reduction, distributed generation strategies, and other available tools to empower consumers to have more control over their energy consumption,” as required by Law 17-2019 Section 1.5(4)(b). In the approved IRP,<sup>14</sup> PREB determined that energy efficiency programs are always the least cost resource, and that the maximum level of EE deployment should be a core provision of an approved Preferred Resource Plan. Federal funds earmarked for these programs would allow for implementation needed, energy conservation and efficiency.

#### *B. Viability of rooftop solar, BESS, power electronics, and other alternatives*

Law 17-2019 directs PREPA to “maximize the use of renewable energy” and, at the same time, “aggressively reduce the use of fossil fuels” and “minimize[e] greenhouse gas emissions...”<sup>15</sup>

PREPA has announced that the first tranche of the renewable energy installations will be legacy power purchase and operation agreements for utility scale, land-based installations, often on agricultural land and/or ecologically sensitive areas. These projects would depend on the existing, vulnerable T&D system that failed after Hurricane Maria and has failed after every other major hurricane in the past 30 years.

The breakdown of energy consumption by group indicates that commercial and residential clients constitute the lion’s share of energy demand in Puerto Rico while industrial clients barely consume about 13% of energy generation. The commercial sector consists of sprawling malls and other installations with expansive parking lots and rooftops that can be used to site solar arrays to power operations. Much residential construction in Puerto Rico consists of single-family housing developments known as urbanizations. They are especially expansive and prevalent in the San Juan metropolitan area and can provide the onsite “rooftop resource” referenced in the Department of Energy (“DOE”) commissioned studies by faculty at the University of Puerto Rico at Mayaguez (“UPRM”), recommending widespread use of existing structures to site PV installations, which also coincides with the major energy demand center in Puerto Rico.

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<sup>13</sup> Negociado de Energía en vivo, Evidentiary Hearing / CEPR-AP-2018-0001, YouTube (Feb. 6, 2020), <https://youtu.be/HO40ImpqKe8?t=3669>.

<sup>14</sup> Final Resolution and Order, paras. 634- 635, <https://energia.pr.gov/wp-content/uploads/sites/7/2020/08/AP20180001-IRP-Final-Resolution-and-Order.pdf>.

<sup>15</sup> Law 17-2019 Section 1.5(6)(b), Section 1.11(d).

Multiple studies have proven the resiliency of onsite photovoltaic and battery energy storage systems.<sup>16</sup> Renewables and BESS can serve critical loads and provide resilience. PREPA's contractor, Siemens Industry, ultimately acknowledged that renewable resources could be available immediately after a major event (e.g., hurricane, power outage). Therefore, Siemens' original assumption in the IRP that base fossil generation was indispensable was wrong.<sup>17</sup> Siemens's rebuttal testimony acknowledged that the June 2019 draft IRP did not recognize the full value of renewables, stating that solar panels could be certified to withstand major events, and therefore should have been considered to supply critical loads.<sup>18</sup> In December 2019, the Energy Bureau's Energy Storage Study confirmed that "thermal resources are not required to prevent loss of critical loads."<sup>19</sup>

The advantages of rooftop solar are many, they include the use of existing rooftops of sprawling housing and commercial developments to avoid further impacts to open spaces, agricultural land and ecologically sensitive areas. Rooftop and onsite solar eliminates the need for large investments in transmission infrastructure. It avoids transmission losses and vulnerabilities. Grid maintenance costs are reduced and impacts to forests ecosystems and vegetation as a result of tree cutting and pruning are minimized. The rooftop solar alternative does not require establishing extensive easements or servitudes on private property while helping to lower temperatures within the structures and providing protection to the buildings. Rooftop solar installations add value to the structures and promote local wealth. Distributed generation on rooftops creates greater reinvestment in the local economy than fossil fuel projects. It enables ratepayers to become producers or 'prosumers' of energy not mere consumers and allows for control by residents and local communities which is particularly important during outages of the main grid as was experienced after Hurricane Maria. Rooftop solar enjoys broad civil society support as opposed to utility scale, land-based installations. The advantages of using the "roof top resource" for photovoltaic energy systems also include avoiding the use of the large quantities of fresh and salt water required by fossil fuel combustion plants, reduction in the discharges of overheated thermal waters to water bodies, reduction of entrapment of marine species by the suction systems of fossil fuel plants, avoiding the impacts of spilled chemicals and other pollutants

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<sup>16</sup> See National Renewable Energy Laboratory, Distributed Solar PV for Electricity System Electricity, Policy and Regulatory Considerations, <https://www.nrel.gov/docs/fy15osti/62631.pdf> (last visited Dec. 17, 2020); See Eliza Hotchkiss, How Solar PV Can Support Disaster Resiliency, <https://www.nrel.gov/state-local-tribal/blog/posts/how-solar-pv-can-support-disaster-resiliency.html> (last visited Dec. 17, 2020).

<sup>17</sup> In addition, Siemens did not take distributed storage into consideration. PREPA Response to the Third Discovery Request to PREPA from Local Environmental Organizations, ROI 3.56, p. 36 (Oct. 25, 2019). See Attachment 1.

<sup>18</sup> See PREPA's Mot. to Submit Corrected Rebuttal Test., Direct Test. of Nelson Bacalao, PH.D. at 7, (Jan. 20, 2020), <https://energia.pr.gov/wp-content/uploads/sites/7/2020/01/Corrected-Rebuttal-Testimony-of-Nelson-Bacalao-PH-D.-in-Support-of-PREPAs-Draft-Integrated-Resource-Plan-CEPR-AP-2018-0001.pdf>.

<sup>19</sup> Puerto Rico Energy Bureau, Energy Storage Study For a Renewable and Resilient Island Grid for Puerto Rico at Section 6.1 (Dec. 19, 2019), filed in Dkt. NEPR-MI-2020-0002, <https://energia.pr.gov/wp-content/uploads/sites/7/2020/01/NEPR-MI-2020-0002-Estudio-Sistemas-de-Almacenamiento-de-Energia%CC%81a.pdf>.

to marine species and vegetation, protection of public health due to a decrease in toxic emissions to air, water and land, decrease in greenhouse gases that promote climate change, among others.

PREB has recognized that renewables and especially distributed renewables have numerous benefits beyond just electric output, such as ancillary services,<sup>20</sup> resiliency benefits, and reduction of transmission and distribution system losses.<sup>21</sup> PREPA’s Status Report in the IRP case also acknowledges that distributed renewables have benefits beyond electric output.<sup>22</sup> Rooftop and/or onsite solar coupled with BESS, EE and other programs could provide the resiliency that residents and businesses in Puerto Rico need to save lives. Therefore, we urge the government of Puerto Rico and federal agencies to earmark the FEMA funds for these types of alternatives.

During the technical hearings in the PREPA IRP process, multiple experts provided numerous recommendations that would immediately implement onsite renewables, storage, and energy efficiency programs, and achieve the transformation of Puerto Rico’s electric grid to better serve the people of Puerto Rico. Federal funding afforded to PREPA should be earmarked for these types of programs. On the other hand, continued reliance on large, centralized power plants and long, vulnerable South-to-North transmission lines would not promote the resilience of the electricity grid to climate related and other disasters. Hurricane Maria and the seismic events of this year showed the importance of decentralizing the power network. A distributed generation system centered on onsite/rooftop solar will be more resilient and, after an emergency, will allow for prompt restoration of energy services, fulfilling the responsibility of saving lives.

These alternatives stand in stark contrast to the use of billions of dollars in federal taxpayer funds to rebuild and “harden” the existing T&D system and add more fossil fuel generation, especially so-called “natural” methane gas infrastructure. The federal government should work with PREPA to initiate a transparent process for acquisition or procurement of solar equipment and BESS to be installed, operated, and maintained by the dozens of PREPA employees who have been trained in renewable energy technology in conjunction with local contractors and organized communities. These types of investments would create jobs and have greater multiplier effects in the Puerto Rico economy.

As noted in the proposed CDBG-MIT Action Plan; “The advantage of renewables is that while they—like the existing PREPA grid—would require significant investment upfront, they would not have the exorbitant cost of purchasing and importing fuel for those power systems, year

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<sup>20</sup> For example, frequency response, operating reserve, and reactive support. See Final Resolution and Order para. 862, pp. 268-269, <https://energia.pr.gov/wp-content/uploads/sites/7/2020/08/AP20180001-IRP-Final-Resolution-and-Order.pdf>.

<sup>21</sup> *Id.*

<sup>22</sup> PREPA’s Status Report in the IRP case, at 6, recognizing “T&D system loss benefits for DG/storage bids” and “potential for additional resiliency benefits.” See PREPA’s Presentation of Status Report on the Development of PREPA’s Draft Procurement Plan at p. 6 (Sept. 23, 2020), filed in Dkt. NEPR-AP-2018-0001, <https://energia.pr.gov/wp-content/uploads/sites/7/2020/10/20200923-PRESENTATION-OF-STATUS-REPORT.pdf>

after year. Investment in renewable energy development could create stability not only in terms of reliable energy, but also jobs and environmental factors.” (p.158).

The original government estimates for deployment of renewables indicated figures in the order of \$4-6 Billion. In the Puerto Rico Disaster Recovery Plan, the Government of Puerto Rico requested \$4.2B to \$6.2B to increase solar energy generation.<sup>23</sup> The Government should reinstate the original \$6 B for rooftop/onsite solar + storage, energy efficiency and similar programs.

While the proposed CDBG-MIT plan acknowledges the extensive damage to the power grid, i.e. transmission and distribution infrastructure as a result of the 2017 hurricanes and the “longer-term timeline on a comprehensive power system overhaul”, HUD proposes to make a separate allocation of \$1.93B for power grid repairs under a separate Federal Register notice and “has prohibited the use of CDBG-MIT funds for electrical system improvements or risk mitigation until the notice is released.” Thus, erroneously underinvesting in rooftop and onsite solar as a first line of defense for Puerto Rico residents and businesses. The proposed “localized energy resilience measures”, like rooftop or onsite solar and BESS are seriously underfunded.

Earmarking federal funds for the localized solar + storage through the public utility to carry out a transparent procedure for large scale acquisition of PV and BESS would serve three paramount purposes: 1-provide access to energy resiliency to the lowest income sectors of the population who would not be able to access loans, rebates or leases for solar + storage, 2-provide a uniform procedure through the public utility that would hasten the implementation of rooftop or onsite solar and storage installations and 3- break the cycle of disaster damage, reconstruction, and repeated damage of the vulnerable, centralized T&D system that so often interrupts life-saving electric service.

Rooftop and onsite solar and the other alternatives discussed above provide lifeline stability and strengthening. The investment in rooftop/onsite solar should align with the original estimates as eligible projects in the plan to “foster investment in lifeline infrastructure improvements while creating jobs.” (p. 274). However, investment in utility-scale, land-based renewable energy projects implicate a continued reliance on the existing T&D system and would not provide the resiliency benefits of rooftop/onsite renewables and storage. Rooftop solar and BESS would provide “redundant, alternative, and independent power systems”, because, as noted in the proposed CDBG-MIT plan; “Billions in federal funding have been expended on repairs yet Island-wide power outages continue to contribute to an unmet need for reliable power.” (p. 281). This will continue to be the case because centralized generation and T&D largely carrying power from the large fossil fuel plants in the South to Northern Puerto Rico, primarily the San Juan

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<sup>23</sup> See Transformation and Innovation in the Wake of Devastation: An Economic and Disaster Recovery Plan for Puerto Rico, pp. 297 & 318 (Aug. 8, 2018); [https://reliefweb.int/sites/reliefweb.int/files/resources/pr-transformation-innovation-plan-congressional-submission-080818\\_0.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/pr-transformation-innovation-plan-congressional-submission-080818_0.pdf) (last visited Dec. 17, 2020).

metropolitan area will continue to be impacted by hurricanes and storms, floods, vegetation, wildlife and other hazards.

## **THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE REGULATORY FRAMEWORK**

The National Environmental Policy Act (“NEPA”) has two principal objectives: 1) The statute imposes an obligation on proponents to consider every significant aspect of the environmental impact of the proposed action; and 2) It ensures that an agency will inform the public that it adequately considered environmental concerns.<sup>24</sup> NEPA requires agencies to systematically address the environmental impacts of their decisions and prevent overvaluation of economic benefits and undervaluing environmental effects because they may be harder to quantify.

NEPA is a way to address interrelated effects of the actions of different agencies. NEPA mandates the use of all practicable means to foster and promote the general welfare and to create and maintain conditions under which humans and nature can exist in productive harmony.<sup>25</sup> In order to comply with NEPA, federal agencies must:

- A. Use a systematic, interdisciplinary approach to insure the integrated use of natural and social sciences and environmental criteria in decision-making.;
- B. Identify and develop methods to quantify environmental values so that they can be considered sufficiently along with economic and technical considerations; and
- C. Include an impact statement in every report on proposed legislation and other major Federal actions significantly affecting the quality of the human environment. An EIS must include a discussion of the: 1) environmental impact of the proposed action; 2) adverse environmental effects that cannot be avoided if the project is implemented; 3) alternatives to proposed action; 4) the relationship between local short-term uses of the environment and its maintenance and enhancement of long-term productivity; and 5) irreversible and irretrievable commitments of resources which would be involved. The lead agency must make the Environmental Impact Statement (“EIS”) and comments made by other agencies available to the public.  
...
- E. Study and describe alternatives to the courses of action in the proposal which involve unresolved conflicts on use of resources.

42 U.S.C.A. § 4332.

NEPA prohibits segmentation of the environmental analysis of an agency action, agencies may not divide a large project into small actions which don't rise to the level of "significant."<sup>26</sup> The Council on Environmental Quality (“CEQ”) requires that "connected actions" must be

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<sup>24</sup> “The purpose and function of NEPA is satisfied if Federal agencies have considered relevant environmental information, and the public has been informed regarding the decision-making process.” 40 C.F.R. 1500.1(a).

<sup>25</sup> 40 C.F.R. 1500.1(a).

<sup>26</sup> *City of W. Chicago, Ill. v. U.S. Nuclear Regulatory Comm'n*, 701 F.2d 632, 650 (7th Cir. 1983).

considered together in an EIS. 40 C.F.R. § 1501.3. Actions are "connected" if: i) they automatically trigger other actions which may require an EIS; ii) cannot or will not proceed unless other actions are taken previously or simultaneously; and iii) they are interdependent parts of a larger action and depend on the larger action for their justification.<sup>27</sup> A comprehensive EIS is necessary when several proposed actions that will have a reasonably foreseeable environmental trends and plan actions on an area are pending concurrently before an agency. 40. C.F.R. § 1502.15.

NEPA requires mitigation of environmental impacts uncovered in an EIS, See 40 CFR §1505.3. NEPA is a grant of authority to the agency "as a supplement to its existing authority" to protect the environmental "to the fullest extent possible". 40 CFR §1500.6.

The *NRDC v. Morton*<sup>28</sup> case involved the proposed leasing of submerged federal lands off the coast of Louisiana for oil and gas production. An EIS showed adverse environmental effects of the proposed leases, but the agency approved the transaction. NRDC argued that the agency was required to discuss environmental effects of the alternatives, but the agency argued that no such discussion was needed, only a statement of alternatives. The court held that section 102(2)(C) requires the agency to consider alternatives and evaluate the environmental impact of those alternatives. The court further held that agencies must provide information sufficient to permit a reasoned choice of alternatives and cannot disregard alternatives that don't offer a complete solution to the problem. And agencies must discuss alternatives even if they are outside the agency's authority or if they require legislative implementation.

Courts have voided projects where the agency failed to conduct the careful, coordinated safety and environmental impact review, with robust public participation, set forth by the National Environmental Policy Act. See, e.g., *W. Watersheds Project v. Zinke*, 336 F. Supp. 3d 1204, 1212 (D. Idaho 2018)(finding that the Bureau of Land Management's practices had violated NEPA public participation requirements, and that the preclusion of public participation was irreparable harm, sufficient to warrant a preliminary injunction.) In that case, the court granted relief necessary to "remedy for present purposes the harm and hardships caused by BLM's curtailment or preclusion of the opportunity for meaningful public participation. . . which on the present record appears to violate public participation requirements of ... NEPA." Id.<sup>29</sup>

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<sup>27</sup> 40 C.F.R. 1501.9(e)(1).

<sup>28</sup> *Nat. Res. Def. Council, Inc. v. Morton*, 458 F.2d 827 (D.C. Cir. 1972).

<sup>29</sup> See also *Sierra Club v. Van Antwerp*, 719 F. Supp. 2d 77, 80 (D.D.C. 2010) (partially vacating permit and remanding to agency for NEPA violation); *Humane Soc'y of the U.S. v. Johanns*, 520 F. Supp. 2d 8, 37 (D.D.C. 2007), citing *Am. Bioscience, Inc. v. Thompson*, 269 F.3d 1077, 1084 (D.C. Cir. 2001) ("[V]acating a rule or action promulgated in violation of NEPA is the standard remedy."); *Pub. Emps. for Envtl. Responsibility v. U.S. Fish and Wildlife Service*, 189 F. Supp. 3d 1, 2 (D.D.C. 2016) (reviewing cases and finding vacatur is the standard remedy). If vacatur is an appropriate judicial remedy for a permit issued in violation of NEPA, an order to cease operations at a facility that started operations without any permit must also be an appropriate judicial remedy. *Standing Rock Sioux Tribe v. United States Army Corps of Eng'rs*, 2020 U.S. Dist. LEXIS 117866, \*38, \_\_\_ F. Supp. 3d \_\_\_, (D.D.C. 2020) (vacating agency permit and ordering that oil pipeline be shut down for failure to comply with NEPA). Indeed, agency failure to follow the requirements of NEPA opens that agency to injunctive relief from a court. See *Realty Income Tr. v. Eckerd*, 564

In the major federal action contemplated in the granting of a historic amount of funds, FEMA should be guided by its administrative procedure known as, “A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action”.<sup>30</sup> The Whole Community approach enables residents, emergency management practitioners, community and social service organizations and other stakeholders to collectively understand and assess the needs of communities and determine the best ways to organize and strengthen assets, capacities, and interests to achieve societal security and resilience.

### **THE ENDANGERED SPECIES ACT**

Section 7(a)(2) of the Endangered Species Act requires that all federal agencies ensure that their actions “are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of” their critical habitat. 16 U.S.C. § 1536(a)(2). Federal agencies are required to consult with the U.S. Fish and Wildlife Service (FWS) to ensure that the agency actions comply with the substantive mandates of section 7(a)(2). Id. The ESA’s implementing regulations broadly define the scope of agency actions subject to the ESA section 7(a)(2) mandates to include the granting of licenses and permits. 50 C.F.R. § 402.02.

Under ESA Section 9, 16 U.S.C. § 1538(a)(1)(B), it is illegal for any person – whether a private or governmental entity – to “take” any endangered species of fish or wildlife listed under the ESA. By regulation, FWS has made the take prohibition applicable to threatened species. The § 7(a)(2) consultation process assists the action agency in discharging its duty to avoid jeopardy, and also affects the agency’s obligation to avoid the take of listed species by providing an incidental take statement that shields the action from liability for take incidental to an otherwise lawful activity so long as that take does not jeopardize the species.

The proposed FEMA funding for the construction of multiple infrastructure projects will adversely affect listed species. Compliance with the procedural provisions of the ESA—making the determination of the effects of the action through the consultation process—is integral to compliance with the substantive requirements of the Act. Under this statutory framework, actions that “may affect” a listed species or critical habitat may not proceed unless and until the federal agency ensures, through completion of the consultation process, that the action is not likely to cause jeopardy or adverse modification of critical habitat. 16 U.S.C. § 1536(a); 50 C.F.R. §§

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F.2d 447, 456 (D.C. Cir. 1977) (“[W]hen an action is being undertaken in violation of NEPA, there is a presumption that injunctive relief should be granted against continuation of the action until the agency brings itself into compliance.”).

<sup>30</sup> See A Whole Community Approach to Emergency Management: Principles, Themes, and Pathways for Action, FDOC 104-008-1 (December 2011), [https://www.fema.gov/media-library-data/20130726-1813-25045-0649/whole\\_community\\_dec2011\\_2.pdf](https://www.fema.gov/media-library-data/20130726-1813-25045-0649/whole_community_dec2011_2.pdf) (last visited Dec. 17, 2020).

402.14, 402.13; see also 16 U.S.C. § 1536(d). FEMA may not permit any activity to move forward until valid consultation processes are complete for each of the species that may be affected.

Habitat degradation is probably the main trigger for the extinction wave currently being experienced. In addition to ESA requirements, as discussed above, NEPA regulations require federal agencies to study and, when required, disclose in an EIS, significant environmental impacts that may be caused by a federal action, and then “Use all practicable means” to “avoid or minimize any possible adverse effects of their actions upon the quality of the human environment” . . . “to the fullest extent possible.” (40 CFR §1500.2). The multiple infrastructure projects to be funded by FEMA present a high risk of significant impacts to endangered species and the environment. The PEA, business as usual approach is what has led to the extinction of many species.

### **COMMENTS TO FEMA PROGRAMMATIC ENVIRONMENTAL ASSESSMENT**

#### *I. The Programmatic Environmental Assessment fails to provide adequate detail of the work proposed.*

The PEA states that, “the electric grid includes 2,478 miles of transmission lines, 31,485 miles of overhead and underground distribution lines across the service territory, and 334 substations and transmission centers. (p.63). “All the 2,478 miles of transmission lines and remaining electrical grid infrastructure required survey and repair and 25 percent of all the structures were damaged and temporarily rebuilt” (p.73). Other sources point to 75% of T&D infrastructure damaged by Hurricane Maria.<sup>31</sup> The historic amount of FEMA funding and the proposed infrastructure work would be a massive undertaking, that would involve principally rebuilding, “hardening” and some undergrounding of the existing grid. The PEA presumably proposes to address the impacts of the proposed permanent work on the damaged structures and other infrastructure work. That is not explicitly stated in the PEA.

One of the main shortcomings of the PEA is the total failure to provide specific lists, descriptions, mapping or any other indication of the electric infrastructure grid work that is proposed in each area. The PEA contains generic references to rebuilding, replacement and relocation of multiple transmission and distribution towers, poles, lines, backup generators, substations and similar infrastructure that lacks any information as to the extent, magnitude, number of total miles and areas where the work would be carried out or the potential concentration of work in specific areas. For example, Hurricane Maria made landfall in the Municipality of Yabucoa but there is no information in the PEA that any area in particular, would experience more work projects and related impacts. The environmental impacts of the project alternatives in the PEA are significant, not conducive to mitigation to less than major and merit the preparation of an Environmental Impact Statement (“EIS”). A Finding of No Significant Impact (FONSI) would not

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<sup>31</sup> The Puerto Rico Association/College of Engineers and Surveyors determined that the onslaught of Hurricane María in 2017 damaged 2,700 transmission towers and 75% of the distribution circuits. <https://www.infraestructura2030.com/comisi%C3%B3n-de-energ%C3%A9tica>.

adequately address the multiple significant environmental impacts of the extensive infrastructure work proposed.

The PEA contains alarming inaccuracies concerning the Puerto Rico electric system that range from the number of generation sites to percentages of fuels used. For example, the PEA erroneously states that; “Approximately 69% of PREPA’s 5,839 megawatt (MW) generating capacity is from petroleum.” (p. 63).

*II. The Programmatic Environmental Assessment fails to adequately consider alternatives to centralized fossil fuel power plants, which could lessen or eliminate the need for expensive transmission system projects.*

The principal flaw of the PEA is that it fails to consider viable alternatives to the rebuilding, “hardening” and undergrounding of the existing T&D system. Passing references in the PEA to onsite solar are inadequate as a discussion of onsite solar + storage as a full-blown alternative to centralized long-distance transmission and distribution of electric power. The PEA limits solar installations to backup power at conventional fossil-fueled facilities rather than discuss solar + storage as an alternative in its own right to transform the electric system and avoid the significant adverse impacts of rebuilding or relocation of the T&D system.

As noted in the PEA, “Under the Stafford Act, FEMA has authority to provide funding for cost-effective hazard mitigation and resiliency measures for facilities damaged by Hurricane Maria. Additionally, FEMA is authorized to provide funding to eligible grant Applicants for cost-effective activities that have the purpose of reducing or eliminating risks to life and property from hazards and their effects.” (p.9). More specifically, FEMA may provide funds for “utility system restoration, replacement, upgrade, expansion, redesign, or relocation that can contribute to reducing the potential for future damages.” (p.9). The PEA indicates that it includes projects for; “supplemental power generation, transmission, and distribution facilities, including, but not limited to, wind turbines, solar farms, generators, substations, and power lines; natural gas transmission and distribution facilities”.” (p.11), among others. Clearly, FEMA has the authority to fund onsite or rooftop solar + storage in a way that redesigns and relocates facilities to reduce risks to life from lack of electric service stemming from downed power lines as occurred after Hurricane Maria.

The PEA is contradictory as to additional capacity in the electric system that would result from the proposed work, on the one hand referencing “utility retrofits to accommodate greater capacity” (p.25) and subsequently alleging that “ Due to limiting capacity to pre-Hurricane Maria levels, there would be no additional long-term energy demands on the Commonwealth’s utility networks.” (p.63).

New power generation would include the installation of “combined heat and power systems, rooftop solar, fossil fuel powered standby generators, battery storage, and building energy management systems” and “Associated actions will involve the construction of on-site fuel

storage, installation of transmission and distribution lines, and construction of substations or switch stations.” (p.16). The mere reference to different alternatives does not satisfy NEPA requirements. The agency must discuss, explain and provide public information of each alternative. Installation of redundant power sources, including onsite stand-by generation could involve new fuel sources such as highly flammable Liquified “Natural” Gas (“LNG”) which would need to be revaporized prior to combustion for power generation.

The references in the PEA to back-up power generation equipment that might decrease air emissions fails to acknowledge that renewables would avoid air pollution and emissions altogether as well as fossil fuel dependency. The benefits of renewables are not discussed as an alternative that would not simply reduce emissions but eliminate air pollution altogether. The proposed fossil fuel generation does not contribute to achieving the renewable energy mandate in the Puerto Rico Climate Change Mitigation Adaptation and Resilience Act or the Energy Public Policy Act. PEA alternatives 2 and 3 are contrary to local law because they will impede or delay the distributed renewable energy goals of Law 17-2019 and the recently approved IRP. Consideration of alternatives must comply with both federal and local law. The viability of alternatives other than those listed in the PEA has been determined in the IRP and local law and must therefore be considered by FEMA in the corresponding environmental document. This PEA fails to address this issue.

The PEA is a highly biased document which cannot serve the purpose of excluding the preparation of an EIS. It not only excludes other viable alternatives as described above, but also fails to consider the environmental effects of the preferred and/ or considered alternatives. Some of those consequences are discussed in Parts I-VIII of these comments. The FEMA funding proposed in the PEA (page 9) is a major Federal action significantly affecting the quality of the environment. Among those effects are the significant negative environmental justice consequences of delaying or eliminating renewable distributed energy options.

The PEA incorporates a faulty procedural approach, a haphazard scheme for the environmental analysis for the vast array of infrastructure work proposed; “In accordance with the procedures documented in Section 1 for implementing this PEA, utility projects that constitute a more substantive action such as a new sewer treatment facility may require a supplement (sic) analysis and a SEA to fully comply with NEPA. For all Action Alternatives, a tiered EA or separate NEPA process may be required if an action’s impacts on any resource cannot be mitigated to less than major impacts according to the scale in Section 5. Construction areas, including cleared staging areas and access roads that are greater than five acres for previously disturbed areas that require minimal clearing and up to two acres for undeveloped land requiring clearing, grubbing, or ground disturbance, would be considered on a case-by-case basis to avoid any major impacts to sensitive resources. If a proposed project exceeds the geographical constraints considered for this PEA, it can be evaluated by a FEMA approved specialist for the purpose of determining if its impacts are in alignment with what has been determined herein or if additional NEPA documentation is required.” (p. 11). This supplemental analysis and tiered EA scheme is

problematic and doesn't comply with NEPA for a number of reasons: 1-It promotes segmentation of the environmental analysis; 2-Environmental review and consultation with relevant agencies is left entirely within FEMA's discretion; 3-Public access to information is piecemeal and unduly limited; and 4-Public input and informed participation is undercut by the staggered administrative process. Allowing such broad agency procedural discretion would effectively negate an integral environmental analysis and cancel out public input.

The PEA is highly biased and skewed towards replicating the existing centralized T&D system and should not be allowed to block the preparation of an EIS. It not only excludes viable alternatives described in these comments but fails to consider the environmental effects of the preferred and/ or considered alternatives. Some of those consequences are discussed here in Parts I-VI. It must be concluded that the grant funding considered in the PEA (page 9) is a major Federal action significantly affecting the quality of the environment. Among those effects are the inevitable negative environmental justice consequences of delaying or eliminating renewable distributed energy options.

*The extent of the electric infrastructure work proposed requires the preparation of an EIS.*

The proposed work includes upgrading or rebuilding up to 20 linear miles of pipeline, transmission, or distribution lines per area. Nowhere does the PEA indicate the areas where this extensive work would take place and whether some areas would be more impacted than others. Potential impacts would not be limited to land. According to PREPA, utility poles are installed between 5 and 14 feet below land surface (PREPA 2000). Water tables can be impacted by such excavations at new sites and even at previously impacted sites. Similarly, the installation of underground power lines will undoubtedly have significant environmental impacts. Flooding is by far, the most prevalent source of disaster damage in Puerto Rico according to the proposed CDBG-MIT plan. Undergrounding of infrastructure may aggravate flooding, impact water courses and resources and expose infrastructure to water damage.

Infrastructure realignment or relocation outside existing Rights of Way ("ROWS") will be determined "according to the needs of Subapplicant and engineering recommendations may involve relocation of utilities up to 200 feet from an existing ROW" and "FEMA will evaluate to determine if greater distances are consistent with this PEA on a case-by-case basis." (p.15). Realignment of pipelines or electric powerlines could extend for up to 10 miles. The PEA fails to specify the magnitude and extent of projects that "require replacement or relocation of contiguous portions of the utility to mitigate risk and restore infrastructure." (p.17). Relocation of utilities at greater distances from an existing ROW, could encroach on fence line communities and the environmental impacts could also be significant.

### *III. The Programmatic Environmental Assessment fails to adequately consider impacts to air, water, species habitats, farmland, and flooding risks.*

The PEA fails to consider that the rate of decline of agricultural land in Puerto Rico has accelerated in the most recent period evaluated.<sup>32</sup> In the last five-year period evaluated, agricultural land in Puerto Rico has decreased from 584,987 cuerdas in 2012 to 487,774 cuerdas in 2017 representing a loss of 17%, or an annual average loss of 16,202 cuerdas.<sup>33</sup>

The PEA acknowledges that the projects may involve “changes to topography” but fails to discuss how topographical alterations impact superficial and ground water flows, flood levels and sedimentation of water courses.

The current operations of PREPA’s large, centralized fossil fuel powerplants are causing exceedances of the National Ambient Air Quality Standards (“NAAQS”), harming the health of the communities near these plants.<sup>34</sup> According to the PEA, the proposed additional fossil fuel generation would not help to achieve PM<sub>10</sub> attainment in the municipality of Guaynabo and would have a “negligible impact on SOx for the municipalities of Bayamon, Catano, Guaynabo, Salinas, San Juan, and Toa Baja”. (p.25). The proposed additional fossil fuel generation would impose even more air-polluting emissions and impacts on these communities, whereas customer-sited rooftop solar + storage would remove these impacts. The PEA does not specify which projects or even how many projects involve the permanent installation of generators and would require additional permitting from PREQB and additional studies, a tiered EA or stand-alone EA if emissions exceed NAAQS levels.

Furthermore, the PEA fails to specify the extent and magnitude of “utility retrofits to accommodate greater capacity” (p.25) which would not only increase short-term minor emissions but may exceed NAAQS. These issues are ripe for review now, so a subsequent tiered EA or stand-alone EA for any exceedances of NAAQS would not comply with NEPA.<sup>35</sup> The Puerto Rico Climate Change Mitigation Adaptation and Resilience Act mandates 20% renewable generation by 2022. This requires that all new industrial equipment not merely meet current efficiency standards but rather that the equipment eliminate or decrease emissions.

The PEA fails to acknowledge that noise from realignment or relocation of utilities could impact communities with long-term noise effects.

The PEA notes the significant adverse impacts to water resources from the four thermoelectric power plants that use large amounts of saline (seawater) for cooling, “The instream

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<sup>32</sup> See Attachment 2, Dr. David Sotomayor’s *Informe sobre el impacto de la construcción y operación del proyecto Montalva Solar Farm en la zona de la Reserva Agrícola del Valle de Lajas*, October 2020, Montalva Solar Project Environmental Impact Assessment Draft comments, Docket 2020-314865-REA-004636.

<sup>33</sup> 2017 Census by State - Puerto Rico | 2017 Census of Agriculture | USDA/NASS, [https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Outlying\\_Areas/Puerto\\_Rico/prv1.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Outlying_Areas/Puerto_Rico/prv1.pdf)

<sup>34</sup> See Attachment 3, October 2019 Testimony of Dan Gutman, Puerto Rico Energy Bureau Docket CEPR-AP-2018-0001.

<sup>35</sup> 40 C.F.R. § 93.158, 40 C.F.R. § 1501.11.

saline withdrawals totaled 2,262 Mgal/d (8,562.6 ML/d) (Molina-Rivera 2010)” but fails to acknowledge that rebuilding the T&D system will perpetuate these impacts.

The PEA’s allegation that, “relocating utilities within a new or expanded ROW would have similar impacts and mitigation measures as those described for Alternative 2” (p.31) and “may have a negligible to minor direct or indirect on impact water resources, including wetlands and waterways; but would have mitigation through Section 401 and Section 404 permitting” (p. 32) is wholly unsubstantiated. The extent of the damages including flow impediment and other adverse impacts to stream and floodplain hydraulics and function cannot be characterized as “moderate”. Relocation of utilities in El Yunque National Forest or a Wild and Scenic River and other sensitive ecologic areas require the preparation of an EIS. The sheer magnitude of potential relocation work mandates an EIS.

The PEA erroneously assumes that the implementation of subsequent hydrologic analyses and mitigation measures can avoid the need to discuss significant environmental impacts. The PEA fails to first determine, as a threshold matter whether the projects would have significant impacts. FEMA must specify the number, location, magnitude and extent of projects that will impact wetlands, streams, and other Waters of the United States (“WOTUS”). As these water impacts are ripe for review now, subsequent tiered review would not comply with NEPA standards.<sup>36</sup> The PEA acknowledges that, “certain sites could result in some fill placed within the wetland boundaries during construction” and proposes that, “Where individual projects may impact wetlands, streams, or WOTUS, FEMA would consider further tiered review”. (p.34). It is not difficult to envision a scenario where various “individual projects” in the same area could cause significant adverse impacts.

The PEA erroneously and repeatedly alleges that the, “process of relocating utilities within a new or expanded ROW would have the same impacts and mitigation measures as those described for Alternative 2”. (p.34). Similarly, the allegation that expanding a ROW including embankment and in-water work that may impact wetlands will have “minor short-term direct or indirect impacts on wetlands” (p.34). lacks credibility and is not remedied by subsequent Section 401 and Section 404 permitting because there would be no previous determination of whether the impacts are significant, can’t be mitigated and should be avoided altogether.

The PEA acknowledges that, “some utilities are location-dependent and potentially located within a floodplain, the scope of work of this alternative may have impacts to floodplains. Construction of utilities may result in alteration of the course or magnitude of floodwater.” (p.35). Yet nowhere in the PEA is there even an attempt to identify the proposed areas where the utilities would be sited and to determine whether the work proposed would have significant adverse environmental impacts or a discussion of alternatives.

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<sup>36</sup> 40 C.F.R. § 1501.11.

The PEA asserts that in cases where the proposed changes to utility infrastructure will impact the floodplain/floodway, “FEMA will apply the 8-Step Process to assess potential impacts and practicable alternatives” and that, “Projects may require a hydrology and hydraulics report to evaluate changes to stream hydraulics in detail and compliance with local ordinance.” (p.35). The PEA contains totally unsubstantiated allegations that utility work and changes within floodplains would have “minor impact”. If the impacts are significant, an EIS is required.

The PEA fails to substantiate the conclusion that sites that result in additional impervious surfaces with indirect long-term impacts, would only have “minor impacts on floodplains and floodways”. (p.36). FEMA should list, describe and map projects in the V-zone or projects that have the potential to increase flood elevations in an EIS, not “on a case-by-case basis to determine whether this PEA applies”.

Rooftop solar + storage avoids impacts to floodplains that would be exacerbated by rebuilding utilities with increased footprints resulting in additional impervious area or trenching for placement of underground utilities, potentially impacting nearby floodplains on a long-term or permanent basis. The evaluation of each project using the FIRM panels should be part of the requisite EIS.

It is imperative that FEMA list and map the proposed projects that increase flood elevations to determine the potential significant adverse impacts in each area. A case-by-case or a project by project view, as proposed in the PEA is wholly inadequate.

The PEA erroneously concludes that the proposed work will have, “short-term and long-term negligible to minor adverse impacts to the Coastal Zone Management Area (“CZMA”), associated with upgrading systems that require additional acreage beyond what these systems currently occupy” (p.39), without specifying the specific area or the amount of additional acreage in the CZMA. The October 3, 2018 Federal Consistency Resolution Certificate cannot be used to avoid a NEPA mandated analysis of significant adverse impacts. FEMA acknowledges that realignment or relocation of utilities, will have adverse long-term impacts within the CZMA but rather than determine the extent of the impacts through an EIS, the agency proposes coordination with PRDNER and PRPB at some later time and “limit impacts to the extent possible”. (p.39). A determination of the extent and magnitude of the projects in the CZMA that allows for public information and participation is required.

Proposed mitigation of impacts through permit requirements and Best Management Practices (“BMPs”) for vegetation clearing would not be beneficial in the case of old growth forests, ecologically sensitive areas, and other ecosystems even with implementation of an approved SWPPP. FEMA must list and map the natural areas that will be impacted and prepare an EIS to analyze significant impacts.

The PEA is ambiguous as to how vegetation impacts will be addressed stating that, “the area would either revegetate on its own or be re-vegetated in accordance with the applicable

permits and SWPPP.” (p.40). While acknowledging that, “Deforestation and vegetation clearing exposes areas to invasive species. Relocation of utilities and corresponding ROWs into previously undeveloped areas may cause impacts to additional acreage of vegetation.” FEMA cannot exclude public input by subsequently determining that when, “biological impacts are greater than what this PEA includes, FEMA will review those projects on a case-by-case basis to determine appropriate level of NEPA analysis.” (p.40). The subsequent, case by case approach shuts out informed public participation. NEPA requires consideration of significant environmental impacts of federal agency actions prior to proceeding.

The PEA provides no basis for the allegation that utility projects in, on, or over land, streams, and reservoirs, embankments and in-water work “would likely result in adverse short-term negligible to minor impacts to the habitat during construction activities”, (p.43) and fails to address significant adverse impacts to habitat, wildlife and fish.

Rather than speculate that, “at the programmatic level; the expectation is that landscaped or managed vegetation would occur within the disturbed footprint of many project areas”, (p.46). FEMA should determine, list and map the sensitive biological resources in the project areas. FEMA’s proposed review of projects for the potential occurrence of threatened and endangered species (“T&E”) species and designated critical habitat (“DCH”) in the area should be included in an EIS. Attempts to minimize impacts to T&E Species and DCH through the National Pollutant Discharge Elimination System (“NPDES”) permitting program and implementation of a SWPPP might not mitigate significant adverse impacts that could have been determined in an EIS.

Allegations in the PEA that realignment or relocation of utilities and corresponding ROWs on undisturbed lands would “have an adverse negligible to minor short-term and long-term impact on the federally-listed endangered, threatened, and proposed or candidate species and their DCH” (p.47). are not credible in the absence of indication of the specific sites.

Each project’s scope of work should be included in an EIS to determine potential significant adverse impacts to historic or prehistoric or paleontological archeological resources. The Allowances in the Second Amendment Programmatic Agreement with the Puerto Rico State Historic Preservation Office (“SHPO”) executed on November 13, 2019 (FEMA-Puerto Rico SHPO Programmatic Agreement for Section 106 Review, May 2016, Amended April 2018) cannot be used as a subterfuge to avoid NEPA analysis of significant adverse impacts on historic or prehistoric or paleontological archeological resources. The PEA acknowledges that, “Destruction or alteration of any site, structure, or object of prehistoric or paleontological importance may occur during construction. (p.52). A subsequent Section106 review process and consultation with the SHPO and “appropriate consulting parties” will not comply with NEPA standards.

*IV. The Programmatic Environmental Assessment fails to include adequate public participation measures, especially concerning impacts to environmental justice communities.*

Effective public participation requires specific information about realignment in farmland. It is wholly inadequate if FEMA has discretion to “consult with USDA NRCS to avoid, minimize, or mitigate the impacts” (p.21) but does not discuss the potential significant adverse impacts in a public-facing document. The assertion in the PEA that relocation of a utility “would have a minor impact on geology and soils, negligible to minor impacts on prime or important farmland, and no impacts on seismicity” (p.21) is unfounded.

The PEA fails to describe the major projects to be carried out and how they would impact EJ communities. Rebuilding and hardening the existing T&D system would perpetuate South to North transmission and central station fossil fuel plants in Southern Puerto Rico thus cementing air, water and land pollution that have significant impacts on EJ communities and would continue to disproportionately and adversely affect these low income and afro descendant populations.

The PEA indicates that the public information process would include “targeted outreach to environmental justice populations through notices to community organizations.” (p.79). Yet, no known environmental justice organizations were contacted or notified of the PEA or the comment period.

As noted in the PEA, Community of Concern (“COC”) encompasses any Environmental Justice community that may be disproportionately impacted or overburdened by an action alternative. In Puerto Rico, air quality, commercial and industrial facilities, and land use are considered when analyzing compliance with the Executive Order on Environmental Justice. (E.O. 12,898). The PEA is contradictory, on the one hand erroneously concluding that the percentage of households below the poverty level does not vary a great deal across municipalities or towns in Puerto Rico and subsequently acknowledging variations in racial makeup, income levels, and poverty rates within Puerto Rico. While noting that, “the southeast Municipalities near Arroyo and Yabucoa generally have a higher percentage of black Hispanic population than many other Municipalities”, (p.55). The PEA fails to document the high numbers of afro descendant population in Guayama, Salinas and other municipalities where the most contaminating electric power plants are located.<sup>37</sup> The PEA fails to consider the rooftop/onsite solar + storage alternative that could have positive, enduring multiplier effects in EJ communities, the local economy and employment rates as documented in a recent study.<sup>38</sup> The PEA erroneously claims that, “data does not exist to support a claim that the existing level of utility service is causing widespread losses of

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<sup>37</sup> U.S. Census Bureau, Quickfacts for Puerto Rico; Municipality of Salinas, (last visited on Dec. 17, 2020). <https://www.census.gov/quickfacts/fact/table/PR,salinasmunicipiopuertorico/PST045219>.

<sup>38</sup> The Solar Found., Puerto Rico Solar Jobs in 2050, (2020) <https://www.thesolarfoundation.org/wp-content/uploads/2020/09/PRSolarJobs.pdf>.

employment and reduced access to health services.” (p.55). As noted above, the lack of electric service was linked to hundreds of deaths in the aftermath of Hurricane Maria.<sup>39</sup>

The PEA contains an inadequate discussion of risks to public health and safety. The characterization of social infrastructure facilities in the PEA is limited to emergency services, schools, and hospitals and omits critical government services. The PEA erroneously equates hardening of the T&D system with resilience. Rooftop and onsite solar provides greater resilience than long distance transmission of energy, particularly South to North transmission. Hardening the existing T&D system would not necessarily make it more reliable “against future disasters”. As noted in the first section of these comments, the existing T&D system is inherently vulnerable to hurricanes, storms, vegetation growth and many other hazards. Onsite or rooftop renewable energy generation would provide greater resiliency. Based on the status of Puerto Rico’s utility networks, onsite/rooftop solar + storage would result in long-term benefits to the health and safety of Puerto Rico’s communities. *The Programmatic Environmental Assessment fails to adequately consider resiliency concerns.* The PEA references recent earthquakes and aftershocks but fails to discuss how seismic activity could impact proposed infrastructure, including impacts to large scale utility solar projects.<sup>40</sup>

Relocation of utilities could have potential significant adverse long-term impacts to public health and safety, particularly the relocation of new fossil generation. The implementation of current codes and standards in proposed work does not rule out the potential for significant adverse or cumulative impacts.

*V. The Programmatic Environmental Assessment fails to adequately consider the negative effects of Liquefied Natural Gas facilities.*

The PEA proposes converting generation facilities from diesel to “Natural” (Methane) Gas which in its liquid state is a highly flammable material that may pose a hazard to human health and the environment. Burning LNG at multiple facilities throughout Puerto Rico would increase public health risks. Methane gas combustion also emits increased Volatile Organic Compounds (VOCs) such as formaldehyde, benzene, toluene, hexane, and styrene.<sup>41</sup> Renewables avoid the multiple public health and safety risks of fossil fuel combustion including those discussed in the PEA such as fuel releases that increase during disasters. Renewables avoid investments in

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<sup>39</sup> Dreisbach, *supra* 7.

<sup>40</sup> See, Attachment 4, Dr. José Molinelli Freytes’s report: Deficiencias en el análisis de los impactos geológicos encontrados en la Declaración de Impacto Ambiental del proyecto “Montalva Solar Farm – Guánica – Lajas (Borrador – DIA), October 2020, Montalva Solar Project Environmental Impact Assessment Draft comments, Docket 2020-314865-REA-004636.

<sup>41</sup> Pediatric Environmental Health Specialty Unit (PEHSU), Mount Sinai Medical School, Comments on Draft Aguirre Offshore Gasport Environmental Impact Statement, FERC Dkt. No. CP13-193, at 1-2., in Responses to Comments on the Draft Environmental Impact Statement (document pages CO-65 & CO-66) (Sept. 9, 2014), <https://www.energy.gov/sites/prod/files/2015/02/f20/EIS-0511-FEIS-Volume2-Part2-2015.pdf>.

secondary containment to prevent releases to the environment from aboveground and underground storage tanks.

The PEA or future EIS must also address the likely upstream and downstream impacts of LNG, including on fracking of natural gas and climate change. The most catastrophic environmental impact of all would be the prolonging of the fossil fuel era with huge LNG investments in North America and worldwide instead of directing those investments to renewable energy resources.

For both an EA or an EIS, the purposes of NEPA require the agency to “consider and disclose” the environmental effects of the actions it certifies. *Baltimore Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 96 (1983). So long as the agency takes a “hard look” at the environmental consequences, NEPA “does not mandate particular results.” *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350 (1989). NEPA’s “hard look” requires “discussion of the ‘significance’ of [an] indirect effect, see 40 C.F.R. § 1502.16(b) (2018), as well as ‘the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.’” *Sierra Club*, 867 F.3d at 1374 (internal citation omitted).

Indirect effects “are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.”<sup>42</sup> An environmental impact is reasonably foreseeable “if it is ‘sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.’” *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549 (8th Cir. 2003) (internal citations omitted). Implicit in this requirement to analyze foreseeable effects is a duty to engage in “reasonable forecasting.” *Scientists’ Inst. for Pub. Info., Inc. v. Atomic Energy Comm’n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973). However, here, FEMA failed to account for the context and intensity of the upstream and downstream emissions impacts resulting from the activities proposed in the PEA.<sup>43</sup>

The indirect effects inquiry is wide-ranging. Specifically, under this standard, courts have required federal agencies to consider the indirect effects of energy-related transportation projects. In Mid States, for example, because a new rail line provided a more direct route from coal mines to power plants, the court held that NEPA required the Surface Transportation Board to consider the downstream impacts of burning the coal. *Mid States*, 345 F.3d at 549 (“[I]t is reasonably foreseeable – indeed, it is almost certainly true – that the proposed project will increase the long-term demand for coal and any adverse effects that result from burning coal.”); see also *Border Power Plant Working Grp. v. Dep’t of Energy*, 260 F. Supp. 2d 997, 1030 (S.D. Cal. 2003) (air quality impacts of Mexican power plant that would export electricity to the United States over new transmission line were reasonably foreseeable result of constructing transmission line).

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<sup>42</sup> 40 C.F.R. § 1508.8(b); see *New York v. Nuclear Regulatory Comm’n*, 681 F.3d 471, 476 (D.C. Cir. 2012).

<sup>43</sup> 40 C.F.R. § 1508.27.

Accordingly, “[t]he impact of greenhouse gas emissions on climate change is precisely the kind of cumulative impacts analysis that NEPA requires agencies to conduct.” *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Admin.*, 538 F.3d 1172, 1217 (9th Cir. 2008).

The D.C. Circuit recently ruled in *Sierra Club v. FERC*, 867 F.3d 1357, 1371-1372 (D.C. Cir. 2017), that NEPA required the Federal Energy Regulatory Commission to consider the indirect but reasonably foreseeable impacts of natural gas pipelines which included the downstream greenhouse gas emissions resulting from burning of gas transported by the pipeline in its NEPA review. Although the Commission had claimed that it lacked information regarding the amount of gas that would be burned downstream, the Court found that the agency could “make educated assumptions” about use of gas based on its knowledge of the general capacity of the pipeline. *Sierra Club* at 1374.

Applying *Sierra Club*, federal district courts in other jurisdictions reached similar results. For example, in *San Juan Citizens All. v. U.S. Bureau of Land Mgmt.*, 326 F. Supp. 3d 1227 (D.N.M. 2018), the court rejected BLM’s claim that “consumption is not ‘an indirect effect of oil and gas production because production is not a proximate cause of GHG emissions resulting from consumption.’” *Id.* at 1242. Instead, the court ruled that BLM’s “statement is circular and worded as though it is a legal conclusion...[and] it is contrary to the reasoning in several persuasive cases that have determined that combustion emissions are an indirect effect of an agency’s decision to extract those natural resources.” *Id.*; see also *W. Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, No. CV 16-21-GF-BMM, 2018 WL 1475470, \*13 (D. Mont. Mar. 26, 2018), appeal dismissed, No. 18-35836, 2019 WL 141346 (9th Cir. Jan. 2, 2019) (finding that NEPA requires consideration of environmental consequences of the downstream combustion of the coal, oil and gas resources potentially open to development under agency plan within the NEPA document).

In *San Juan*, the court continued that “it is erroneous to fail to consider, at the earliest feasible stage, ‘the environmental consequences of the downstream combustion of the coal, oil and gas resources potentially open to development’ under the proposed agency action.” *San Juan*, 326 F. Supp. 3d at 1244. Accordingly, the court found that BLM’s action was “arbitrary” due to its failure to estimate the amount of greenhouse gas emissions which will result from consumption of the oil and gas produced as a result of the development of wells in the leased areas. *Id.*; see also *Montana Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1097-99 (D. Mont. 2017), amended in part, adhered to in part sub nom. *Montana Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, No. CV 15-106-M-DWM, 2017 WL 5047901 (D. Mont. Nov. 3, 2017); *Dine Citizens Against Ruining Our Env’t v. U.S. Office of Surface Mine Reclamation and Enforcement*, 82 F. Supp. 3d 1201, 1213 (D. Colo. 2015), *Dine Citizens Against Ruining our Env’t v. U.S. Office of Surface Mining Reclamation & Env’t*, 643 F. App’x 799 (10th Cir. 2016).

*VI. The Programmatic Environmental Assessment fails to consider the cumulative effect of all potential impacts.*

The projects proposed in the PEA are a prime example of how cumulative impacts can result from individual actions over a period. Taken together, various projects in a single area could add incremental cumulative impacts to past and foreseeable future actions. Although the PEA acknowledges that, “The scale of those impacts would depend on the number of projects implemented, the size of the projects, and locality and proximity of the projects” (p.73), no attempt is made to list, describe and pinpoint projects that may overburden specific areas. The cumulative impacts in this case stem from the presumed number of projects proposed such as the large number of transmission and distribution towers, poles and lines and new fossil generation. Although section 5.18.1 of the PEA references the 2,478 miles of transmission lines that required survey and repair and that 25 percent of all the structures were damaged and temporarily rebuilt, the PEA does not specify how many miles of T&D infrastructure would be hardened, undergrounded or otherwise worked on.

Similarly, the PEA states that the USACE installed over 2,300 electric emergency generators in Puerto Rico as part of the recovery efforts (GAO 2018) but does not speak to the siting, capacity or any other detail of the proposed new generation. The environmental analysis in this case should include the joint projects generally referenced in the PEA. The PEA references the magnitude of impacts “described in this PEA” but contains no such description. No basis is provided for the allegation that the Action Alternatives in the PEA “would not result in major cumulative impacts”. FEMA funding will enable relocation and numerous actions that involve infrastructure. Impacts can vary widely even for projects that are similar in function, size, and locality to existing systems. For example, emissions, noise, water requirements, fuel storage and processing vary significantly by type of generation.

The cumulative impacts of temporary repairs vary substantially from more permanent arrangements such as undergrounding. Contrary to the allegations in the PEA that, “the initial installation and temporary restoration of the projects on the human environment have already occurred prior to and after Hurricane Maria.” (p.74) undergrounding would cause significant adverse impacts to land and potentially water resources. Although the extended timeframe (which is not specified in the PEA) may allow for staggering the projects, cumulative impacts can stem from past, present and foreseeable future work. The PEA acknowledges that multiple simultaneous utility projects within the same watershed will have a cumulative impact to vegetation, water quality, and soil could but for some unspecified reason, FEMA erroneously assumes “that cumulative impacts from the utility projects covered under this PEA would be short-term and less than major.” (p.75). In sum, the PEA fails to consider the cumulative impacts of the infrastructure projects.

## **CONCLUSION**

The extensive infrastructure work proposed in the PEA will undoubtedly entail significant adverse environmental impacts. The PEA does not comply with NEPA and the rulemaking process under the APA. The magnitude of the projects and the significant impacts that the FEMA funding

would facilitate, along with the lack of specificity in the PEA regarding the projects that would be developed, impedes an adequate and objective analysis of impacts and alternatives. A programmatic environmental impact statement that discusses alternatives such as onsite, rooftop solar coupled with battery energy storage systems instead of rebuilding the existing electric transmission and distribution system is required.

We therefore respectfully request that FEMA not approve the PEA or issue a FONSI, but rather, draft a full Environmental Impact Statement to correct the inadequacies and legal errors in the environmental analysis for the extensive projects proposed and reconsider its conclusions on the basis of the corrected information.

Please feel free to contact us with any questions.

Sincerely,

*s/ Ruth Santiago*

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**[Ex. 6 Personal Privacy (PP)]**

*s/ Pedro Saadé*

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**[Ex. 6 Personal Privacy (PP)]**

**COMMONWEALTH OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

**IN RE:**

**REVIEW OF THE PUERTO RICO  
ELECTRIC POWER AUTHORITY  
INTEGRATED RESOURCE PLAN**

NO. CEPR-AP-2018-0001

SUBJECT:  
THIRD DISCOVERY REQUESTS

**THE PUERTO RICO ELECTRIC POWER AUTHORITY RESPONSES TO THE THIRD  
DISCOVERY REQUEST TO PUERTO RICO ELECTRIC POWER AUTHORITY  
FROM LOCAL ENVIRONMENTAL ORGANIZATIONS**

TO THE LOCAL ENVIRONMENTAL ORGANIZATIONS:

COMES NOW the Puerto Rico Electric Power Authority and hereby submits responses to the *Third Discovery Request to Puerto Rico Electric Power Authority from Local Environmental Organizations*, dated September 20, 2019. The responses are submitted pursuant to the provisions of Article VIII of Regulation No. 8543, *Regulation on Adjudicative, Notice of Noncompliance, Rate Review and Investigation Proceedings* and also pursuant to the discovery proceedings established in the *Resolution and Order* entered on July 3, 2019.

In San Juan, Puerto Rico, this 25<sup>th</sup> day of October 2019.

/s Katiuska Bolaños  
Katiuska Bolaños  
kbolanos@diazvaz.law  
TSPR 18888

**DÍAZ & VÁZQUEZ LAW FIRM, P.S.C.**  
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**COMMONWEALTH OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

IN RE: REVIEW OF THE PUERTO  
RICO ELECTRIC POWER  
AUTHORITY INTEGRATED  
RESOURCE PLAN

NO. CEPR-AP-2018-0001

**SUBJECT:** THIRD DISCOVERY  
REQUESTS

**PREPA'S RESPONSES TO LOCAL ENVIRONMENTAL ORGANIZATION'S  
THIRD SET OF REQUIREMENTS OF INFORMATION**

**TO: LOCAL ENVIRONMENTAL ORGANIZATIONS**

Through:

Ex. 6 Personal Privacy (PP)

[rmurthy@earthjustice.org](mailto:rmurthy@earthjustice.org)

**FROM: PUERTO RICO ELECTRIC POWER AUTHORITY**

Through its Counsel of record

PREPA objects to any Requirement of Information ("ROI") that calls for information or documents that are not in the possession, custody, or control of PREPA.

For ease of reference, the questions and requirements as set forth in the Request are herein transcribed and shown in bold previous to each answer.

**Request 1**

Our Discovery Request 1.03 requested "*a copy of the USB drive containing PREPA's work papers delivered to the Energy Bureau on June 6, 2019.*" On August 8, 2019, PREPA shared a link for a SharePoint site including numerous files, including some workpapers. On August 15th, PREPA provided a response to our Discovery Request 1.03, stating that a SharePoint site would be created. PREPA's response created the implication there might have been additional workpapers, not on the first SharePoint site, responsive to our request. We therefore amend our Discovery Request 1.03 to ask whether PREPA has any additional workpapers, not on the SharePoint site, responsive to 1.03.

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 1 PREPA confirms that all public documents and workpapers are uploaded to the SharePoint site accessible to the intervenors.

**Request 2** **PREPA's responses to Local Environmental Organizations' Second Discovery Request were due on September 18th at 3pm, under the Energy Bureau's September 17th Resolution and Order. As of this date, we still have not received those responses, and request them again through this discovery request.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 2 On September 23, 2019 the Puerto Rico Energy Bureau granted an extension of the due date of Local Environmental Organization's Second Discovery Request due date to October 4, 2019, and PREPA submitted its responses by the new due date.

**Request 3** **What are the power generation costs reductions from burning methane (natural) gas at the San Juan 5&6 units?**

- a) Indicate the assumptions, calculations and reasoning that leads PREPA to conclude that the conversion to gas will result in \$150 million in fuel savings (PREPA Resolution 4620, p.2).
- b) Will these alleged savings benefit and result in rate reductions to PREPA ratepayers?
- c) What is the impact of the Jones/Merchant Marine Act on the projected savings?
- d) Provide documents on how the fuel savings were calculated and efforts to obtain a waiver of the Jones/Merchant Marine Act for methane gas and/or "energy commodities".

Response to Local Environmental Organizations Third Set of ROIs

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The following responses were provided by Nathan Pollak Director, Filsinger Energy Partners, and James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Pollak and Mr. Bowe each certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 3 a) The conversion of San Juan Units 5 and 6 to consume natural gas (with diesel fuel to remain available as a backup) will result in fuel cost savings which PREPA has estimated could amount on average to as much as \$150 million per year over the five year primary term of the Fuel Sale and Purchase Agreement, dated as of March 5, 2019, between NFEnergía LLC and PREPA (the "FSPA"). Actual savings will vary from this estimate, perhaps significantly, depending on the costs of diesel fuel and of natural gas delivered to the San Juan units, as well as the actual utilization of San Juan Units 5 and 6 over that period.

PREPA has performed a variety of analyses of the potential savings associated with the FSPA. One, completed in early 2019 before the FSPA was approved by the Energy Bureau and the Puerto Rico Financial Oversight and Management Board ("FOMB"), concluded that savings in fuel costs could amount to \$750 million over the FSPA's five year primary term. A more fully developed fuel cost savings analysis, which utilizes conservative assumptions relating to future pricing of diesel fuel and natural gas, was subsequently prepared in response to a request from the FOMB; it is summarized in the Excel spreadsheet attached as Exhibit LEO-PREPA\_ROI\_3\_03.xlsx. This analysis, which was performed in January 2019, indicates that under conservative assumptions regarding fuel prices and unit utilization, PREPA can expect to realize fuel cost savings over the five year primary term of the FSPA of approximately \$534 million, when comparing the FSPA pricing of delivered natural gas to the forward market price of diesel assuming operation of San Juan 5&6 at comparable dispatch levels. Note that the savings estimated in the Exhibit are based on natural gas and petroleum futures prices as of January 2019; a comparison using futures prices available currently could yield somewhat different results.

Request 3 b) Fuel cost savings will directly benefit PREPA ratepayers by a reduction in the fuel cost component reflected in consumer bills for electric service.

Request 3 c): The savings projected from the displacement of diesel by natural gas supplied under the FSPA assume compliance with the requirements of the Jones Act. That is, the projected savings do not depend on a waiver of the Jones Act provisions that preclude deliveries of LNG lifted from U.S. sources other than through vessels that are U.S. built, U.S. flagged, U.S. owned and U.S. crewed. The Fuel Price specified under the FSPA will not vary with the source of LNG delivered to San Juan Harbor.Request 3(d):

Request 3 d) See responses to items a. and c. above.

In December 2018, PREPA, together with the Governor, Secretary of State and the President of the Economic Development Bank of Puerto Rico, sought from the U.S. Department of Homeland Security and the U.S. Department of Defense a temporary

waiver of the Jones Act that would permit the transportation of LNG on non-coastwise qualified vessels from U.S. domestic sources to points in Puerto Rico for use in the generation of electric energy. On August 30, 2019, the Acting Secretary of the Department of Homeland Security informed the Governor of Puerto Rico that he had determined that "any potential grant of Puerto Rico's request for a waiver of the Jones Act is premature" and that "a waiver of the Jones Act is not warranted at this time." PREPA expects to confer with the Governor and other Puerto Rico officials and stakeholders to determine how best to pursue relief from the provisions of the Jones Act that preclude transportation of U.S.-sourced LNG to Puerto Rico.

<b>Request 4</b>	<b>What is the estimated total cost of the project for (a) conversion of San Juan units 5 &amp; 6, (b) revaporization, (c) storage facilities, (d) pipeline infrastructure, (e) fuel costs, (f) other costs? What are the associated costs for PREPA modification and/or conversion of the San Juan 5&amp;6 units, regasification, pipelines and any other local service facilities to enable gas combustion?</b>
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The following responses were provided by Jaime A. Umpierre Montalvo, P.E., Head of Engineering and Technical Services Division, Project Management Office, Executive Directorate, Puerto Rico Electric Power Authority, and James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Umpierre Montalvo and Mr. Bowe each certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 4 The conversion of San Juan Units 5 & 6 permitting the use of natural gas is not a PREPA CAPEX project. The conversion works are being performed in accordance with the provisions of the Fuel Sale and Purchase Agreement, dated as of March 5, 2019, between NFEnergía LLC and PREPA (the "FSPA"). Under the terms of the FSPA, NFEnergía LLC is responsible for siting, permitting, procuring, constructing and operating the LNG receiving, storage, and vaporization facilities that will support the delivery of natural gas to San Juan Units 5 & 6, and for contracting for the conversion of those Units so that they can fire natural gas as well as diesel fuel. All costs associated with these activities are borne by NFEnergía and are to be recovered through the charges for natural gas and the Manufacturing Surcharge (approximately \$833,333 per month, which amounts to \$50 million in total over the contract term) payable under the FSPA. Other than the amount of the Manufacturing Surcharge, PREPA does not possess information as to the specific project costs sought in this ROI, since they are the responsibility of NFEnergía. The estimated aggregate amount of fuel expenditures during

the term of the FSPA (5 years) is expected to be approximately \$1.5 billion, depending on market prices of natural gas over the period.

**Request 5**

**What is the payment structure and terms of the San Juan units 5&6 conversion project, explain the details of the proposed capacity payments (RFP pg. 9, sec. IV).**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 5 The Fuel Sale and Purchase Agreement between the Puerto Rico Electric Power Authority and NFEnergía LLC (the “FSPA”) provides for the conversion of San Juan Units 5 & 6 so that they may use natural gas as their primary fuel and for the supply of natural gas delivered to the converted units for a primary term of five years, with options to extend the term by three additional periods of five years. The FSPA is the culmination of a competitive request for proposal (“RFP”) process in which PREPA sought proposals for the design, engineering, construction, supply, installation, commissioning and testing works required to make San Juan Units 5 and 6 capable of utilizing natural gas for power generation, and the supply natural gas to the converted units. This RFP was conducted in accordance with Section 205(2)(f) of Act No. 83, and included a form of fuel supply agreement in the RFP documentation.

The FSPA provides for payment each month of a Fuel Price multiplied by the Monthly Nominated Quantity, as well as the Manufacturing Surcharge, applicable taxes, and other charges owed, less the proceeds of any Mitigation Sale or other sale of any excess nomination of gas, less any Carryover Credit. The payment mechanics are discussed in Article XIII and illustrated in Exhibit E of the FSPA, which has been submitted in this proceeding and is publicly available.

NFE has agreed to fund the cost of the new infrastructure at SJ 5&6 in return for PREPA’s commitment to pay a Manufacturing Surcharge of approximately \$833,333 per month for the five-year initial term of the FSPA. The “capacity payments” to which the question refers are not really capacity payments as such. Rather, they are monthly payments which are intended to permit NFE to recover a portion of the new fuel supply infrastructure and conversion works NFE is funding under the terms of the FSPA. PREPA has negotiated a provision in the FSPA that gives it the right, should funds become available, to pay NFE a lump-sum in lieu of the monthly Manufacturing Surcharge payment. The lump-sum payment is based on the present value of the \$50 million in payments, which is approximately \$43 million at day-one using a six percent discount rate.

Please note that the FSPA contains not take-or-pay provisions that would require PREPA to pay for gas it does not require, and therefore the total amount that could be expended under the agreement during its primary term could be less than the projected \$1.5 billion.

Note as well that the FSPA includes highly flexible Gas nomination procedures that will enable PREPA to match its requirements with available supplies.

**Request 6**      **Can LNG carriers capable of supplying gas to the San Juan San Juan 5&6 units safely maneuver in the San Juan Harbor Army Terminal?**

- a) Please provide a detailed description of any width limitations that may prevent carriers from delivering bulk LNG.
- b) Please provide a detailed description of any depth limitations that prevent them from delivering bulk LNG.

The following responses were provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** LNG carriers delivering LNG to the floating storage unit to be docked at Wharves A and B immediately adjacent to the San Juan steam generating plant will proceed through San Juan Harbor to a point seaward of and alongside the floating storage unit docked at Wharves A and B, which lie to the east of and are separate from the Army Terminal. The U.S. Coast Guard has determined that LNG carriers can safely transit this route and deliver LNG to the floating storage unit. Letter of Recommendation issued Sept. 26, 2018 by Captain of the Port, USCG Sector San Juan (attached as Exhibit LEO-PREPA ROI\_3\_6.pdf).

Request 6 a): PREPA has no information regarding width limitations that could prevent carriers from delivering bulk LNG to the NFE floating storage unit. PREPA notes that under the terms of the FSPA responsibility for delivering natural gas to San Juan Units 5&6 is assumed by NFE, and accordingly it is NFE's responsibility to ensure that the vessels it employs to transport LNG through San Juan Harbor can do so in compliance with harbor constraints and any requirements imposed by the U.S. Coast Guard.

Request 6 b): b. See preceding response.

**Request 7**      **What is the status of the US Army Corps of Engineers (USACE) San Juan Harbor improvement to widen and deepen the navigation channels in San Juan Harbor?**

**deepen the navigation channels in San Juan Harbor?**

Response to Local Environmental Organizations Third Set of ROIs

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The following response was provided by Jaime A. Umpierre Montalvo, P.E., Head of Engineering and Technical Services Division, Project Management Office, Executive Directorate, Puerto Rico Electric Power Authority. Mr. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 7 USACE informed PREPA that it is currently in the Preconstruction, Engineering and Design Phase. Award of a construction contract to widen and deepen the harbor is currently scheduled for Spring 2021 but this date is subject to the availability of construction funds.

**Request 8**

**Can bulk shipments of LNG sufficient to supply the proposed operation of the San Juan 5&6 units be brought into San Juan Harbor prior to the USACE project?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 8 See the response to Request 6 above.

**Request 9**

**What does the San Juan Harbor Pilot's Association indicate about the minimum channel width required for LNG carriers?**

The following response was provided by Jaime A. Umpierre Montalvo, P.E., Head of Engineering and Technical Services Division, Project Management Office, Executive Directorate, Puerto Rico Electric Power Authority. Mr. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 9 USACE informed PREPA that the project includes a 50-foot widener to both sides of Army Terminal Channel to increase the total width by 100 feet from 350 feet to 450 feet to accommodate larger vessels.

**Request 10**

**Did Ship simulation confirm the need for construction of east and west flares for the Army Terminal Turning Basin**

**to improve turning maneuverability for LR2 Tankers and LNG Vessels?**

The following response was provided by Jaime A. Umpierre Montalvo, P.E., Head of Engineering and Technical Services Division, Project Management Office, Executive Directorate, Puerto Rico Electric Power Authority. Mr. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 10: USACE informed PREPA that the project does include eastern and western flares at the southern terminus of the Army Terminal Turning Basin to accommodate larger vessels.

**Request 11**

**Do vessel operating costs of LNG vessels exceed those of petroleum tankers?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 11 PREPA has not performed any analysis of the operating costs of LNG vessels as compared with the operating costs of petroleum tankers. PREPA notes that such comparisons would be difficult to perform, given the wide range of capacities of LNG vessels and petroleum tankers, the various types of vessels that could be considered “petroleum tankers,” and the variability of operating costs depending on the markets and routes served.

**Request 12**

**Are safety zone requirements for LNG carriers 300 feet in transit and 150 feet at dock?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 12 Safety zones relative to LNG carriers are established by the U.S. Coast Guard on a case-by-case basis. The Coast Guard has not yet established safety zones that would apply other than on a temporary basis to LNG carriers transiting San Juan Harbor and at dock within San Juan Harbor. PREPA understands that the Coast Guard is considering proposed adjustments to the current safety zone established under

33 C.F.R. § 165.754, "Safety Zone: San Juan Harbor, San Juan, PR". The Coast Guard has received comments on this subject in Docket No. USCG-2019-0460.

In a Federal Register notice issued on September 13, 2019, the Coast Guard announced that it would establish, on a temporary basis, a safety zone for LNG carriers expected to arrive in San Juan Harbor during the period from 12:01 a.m. on August 25, 2019 until 11:59 p.m. on November 15, 2019 that is defined as "all navigable waters one half mile around each Liquefied Gas carrier entering and departing San Juan Harbor and a 50-yard radius around each vessel when moored." Safety Zone; San Juan Harbor, San Juan, PR (notice of temporary final rule), 84 Fed. Reg. 48278, 48279 (Sept. 13, 2019) (attached as Exhibit LEO-PREPA ROI\_03\_12.pdf).

**Request 13**

**Is FERC approval being sought for the import of bulk LNG to supply the San Juan plant?**

- a) Has there been any application, consultation or request to FERC for LNG shipment to San Juan Harbor?
- b) Has FERC responded to any such application, consultation or request?
- c) Please provide copies of all documents related to LNG shipments to San Juan Harbor including but not limited to FERC and other government agency files.

The following responses were provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 13 a) No application for FERC authorization for LNG shipment to San Juan Harbor has been filed. PREPA understands that no FERC authorization is required for the siting and operation of the NFEnergía micro fuel handling facility (the "NFE Facility") as it is currently planned and will be configured.

Responsibility for securing all permits required for the construction and operation of the NFE Facility is NFE's under the terms of the Fuel Sale and Purchase Agreement, dated as of March 5, 2019, between NFEnergía and PREPA. PREPA understands that representatives of NFE's affiliate, New Fortress Energy, met with representatives of FERC staff during the fourth quarter of 2017 to discuss the jurisdictional status of what would eventually be proposed as the NFE Facility and the planned provision of natural gas through that facility to San Juan Units 5&6. We have been told that FERC staff representatives concurred with NFE's conclusion that the proposed NFE Facility would not qualify as an "LNG terminal" as that term is defined in the Natural Gas Act and

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therefore would not be subject to FERC's LNG facility siting jurisdiction under Section 3 of that Act. PREPA is aware that NFE elected not to seek a declaratory order from FERC confirming this conclusion. PREPA understands that, on the basis of its jurisdictional analysis and its discussion with FERC Staff, NFE saw no need to seek FERC authorization for the siting and construction of the NFE Facility.

In September 2018 PREPA representatives and PREPA's counsel met with FERC staff representatives to discuss issues relating to the potential expansion of the role of liquefied natural gas in the generation of electric power in Puerto Rico. Those discussions covered the possibility of siting a number of LNG facilities at various locations around the island. In the course of those discussions, FERC staff representatives confirmed that they were comfortable with the conclusion that the NFE Facility, as it had been described to FERC staff, would not be subject to FERC's LNG facility siting jurisdiction light of jurisdictional determinations FERC had reached in other proceedings, given the absence of a natural gas transmission pipeline that would take natural gas away from the NFE Facility and the site of San Juan Units 5&6.

Request 13 b) FERC staff has provided the informal guidance described in item a. above.

Request 13 c) Copies of U.S. Coast Guard correspondence and Federal Register notices relevant to the subject of this ROI are attached as Exhibits LEO-PREPA ROI\_03\_6.pdf and LEO-PREPA ROI\_03\_12.pdf.

**Request 14**

**When is operation of the PREPA plants burning methane gas expected to start?**

The following response was provided by Jaime A. Umpierre Montalvo, Head of Engineering and Technical Services Division, PREPA. Jaime A. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 14 San Juan Unit 5 is expected to commence operation on natural gas during the first week of December 2019. San Juan Unit 6 is expected to commence operation on natural gas at the end of January 2020.

**Request 15**

**What is PREPA's projected annual LNG demand for the San Juan 5&6 units, how was this calculated?**

The following response was provided by Jaime A. Umpierre Montalvo, Head of Engineering and Technical Services Division, PREPA, and Matt Lee, Managing Consultant, Filsinger Energy Partners. Jaime A. Umpierre Montalvo and Matt Lee certify

that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 15 The projected annual demand for natural gas is 25 MMBtu, based on a Capacity Factor of 85% and design fuel consumption of the units (79.6 kpph) at maximum load.

In the ESM Plan, Siemens has modeled the utilization of San Juan Units 5 & 6 (SJ5&6) based on the generation and fuel mix of the existing and proposed fleet. The Long Term Capacity Expansion (LTCE) model incorporates a declining load forecast that assumes population out-migration, increased distributed generation resources, and significant energy efficiency gains. Based on the fixed and variable costs of all potential resources, the LTCE model solved for the right mix of resources to serve the declining load forecast, resulting in the estimated utilization for SJ5&6. The LTCE's modeled results for SJ5&6 indicated an average Capacity Factor of 45% over the next five years (2020-2024), reflecting an average fuel consumption of approximately 12 TBtu per year. This utilization reflects large-scale integration of new generation resources including nearly 1,800 MWs of new PV solar projects and 920 MW of new Battery Energy Storage Systems (BESS).

San Juan Units 5&6 are two of PREPA's most efficient units, with good environmental characteristics. The technology is capable of using cleaner burning, low sulfur fuels like natural gas, and fleet wide statistics indicate the potential for high utilization. Therefore, when PREPA contracted for the supply of natural gas to the units, the contract established a cap of 25 TBtu per year. 25 TBtu per year corresponds to a capacity factor of approximately 85%, and will allow PREPA to provide low sulfur natural gas to SJ5&6 at a level higher than indicated by the LTCE model should circumstances warrant.

**Request 16**

**Provide a detailed description of the plan for LNG supply to the San Juan 5&6 units.**

- a) Who will purchase the LNG, unload, receive, store, gasify, and transfer natural gas to PREPA?
- b) Please provide documents that describe the project.

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 16 a) Under the terms of the FSPA, NF Energía will purchase LNG, unload it, receive it, store it, gasify it, and transfer the revaporized natural gas to PREPA.

Request 16 b) The project defined by the FSPA is described in that agreement, which is a matter of public record. It is further described in the Resolution and Order of the Puerto

Rico Energy Bureau issued in Case No. CEPR-AI-2018-0001 issued on January 25, 2019, and the Resolution and Order and PREPA submissions cited therein.

**Request 17**

**Please provide a detailed description of the source of LNG for supply to the San Juan 5&6 units**

- a) Will the LNG come from the United States?**
- b) Will the LNG come from Trinidad (585 nautical miles)?**
- c) Will the LNG come from Nigeria to San Juan (4,435 nautical miles)?**
- d) What are the transportation costs associated with these different sources?**
- e) Please provide all supporting documentation on the transport of gas to San Juan harbor.**

The following responses were provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 17 a) No. Absent a waiver of the Jones Act and given the unavailability of coastwise-qualified LNG carriers, no LNG sourced in the continental United States may be transported to Puerto Rico.

Request 17 b) It is possible that LNG delivered to San Juan Harbor could originate in Trinidad and Tobago. Sourcing of LNG to supply San Juan Units 5&6 under the terms of the FSPA is the responsibility of NFEnergía.

Request 17 c) It is possible that LNG delivered to San Juan Harbor could originate in Nigeria. Sourcing of LNG to supply San Juan Units 5&6 under the terms of the FSPA is the responsibility of NFEnergía.

Request 17 d) Given that the sourcing of LNG to supply San Juan Units 5&6 under the terms of the FSPA is the responsibility of NFEnergía, PREPA has no specific knowledge

of the transportation costs associated with the potential sources of LNG identified in items a. through c. above.

**Request 17 e)** PREPA has no such documentation, since the sourcing of LNG to supply San Juan Units 5&6 under the terms of the FSPA is the responsibility of NFEnergía.

**Request 18**

**Is there a limit on the frequency of smaller LNG vessels to San Juan Harbor?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 18 PREPA is not aware of any limit on the frequency with which LNG vessels may transit San Juan Harbor.

**Request 19**

**What is the status of the proposed conversion of San Juan 5 & 6 units and the micro fuel handling facility? Please provide all supporting documentation, such as status reports.**

The following response was provided by Jaime A. Umpierre Montalvo, Head of Engineering and Technical Services Division, PREPA. Jaime A. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 19 PREPA understands that natural gas will be available through the NFE micro fuel handling facility by the end of November 2019. See weekly update report attached as Exhibit LEO-PREPA ROI\_3\_19.pdf.

**Request 20**

**Describe the proposed fuel delivery method for the conversion of the San Juan units 5 & 6 project. Please provide all supporting documentation.**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 20 Under the terms of the Fuel Sale and Purchase Agreement, dated as of March 5, 2019, between NFEnergía LLC and PREPA (the "FSPA"), NFEnergía will deliver liquified natural gas by means of a small LNG carrier that will transit San Juan Harbor to a floating storage unit to be docked at Wharves A and B immediately adjacent to the San Juan steam generating station. LNG will be transferred to that floating

storage unit and will subsequently be delivered to an onshore vaporization facility where the LNG will be revaporized and delivered as natural gas via a plant pipeline and manifold to San Juan Units 5&6, where it will be consumed as fuel. The general layout of the fuel delivery system extending from the floating storage unit to San Juan Units 5&6 is depicted in Annexes B and C to the FSPA.

**Request 21**

**Why does the conversion of San Juan 5 & 6 units project include both fuel supply and capital improvements in one RFP/contract?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 21 The price PREPA will pay under the Fuel Sale and Purchase Agreement, dated as of March 5, 2019, between NFEnergía LLC and PREPA (the “FSPA”) will compensate NFEnergía for both the delivery of natural gas to SJ 5 & 6 and the cost of, and presumably a return on, the capital NFEnergía will commit up front to the conversion of the SJ 5&6 turbines so that they can be fired primarily by natural gas (an amount fixed by the terms of the FSPA to a total of \$50 million, to be paid at the rate of \$10 million per year for the initial five year term). The principal advantage of this arrangement from PREPA’s perspective is that it requires PREPA to make no up-front capital investments at a time when PREPA is in no position to make such investments. That is, the FSPA structure it permits PREPA to pay for the cost of investments it is currently incapable of making over time. Another advantage of the arrangement is that it shifts essentially all risk associated with completion of the conversion and related fuel supply system construction to a third party which is experienced in completing LNG-to-gas delivery projects under circumstances comparable to those the SJ 5&6 conversion project presents. PREPA has concluded that an integrated “turn-key” solution that makes the fuel supplier solely responsible for delivering the turbine conversion project, coupled with a flexible gas supply arrangement, is essential to the SJ 5&6 conversion project’s success.

Under the FSPA, NFEnergía has agreed to guarantee cost, schedule, and performance with significant financial penalties in place for failing to deliver at the agreed cost and on time. NFEnergía is highly incentivized to deliver the SJ 5&6 conversion project and the required natural gas fuel supply system on time and on budget, because NFEnergía benefits if the plant is operational and performing as soon as possible, and is penalized if it is not. Therefore, the interests of NFEnergía as both conversion contractor and fuel supplier, and of PREPA as SJ 5&6 owner and fuel consumer, are well aligned. Moreover, the integrated conversion plus fuel supply solution under the FSPA affords PREPA protection from a failure to deliver natural gas through provisions which require NFEnergía to pay to PREPA the difference between the cost of delivered natural gas and diesel. It would be difficult, if not impossible, to obtain such protection without being able

to call upon a single entity to deliver both the conversion works and gas supply. A major disadvantage of decoupling the conversion undertaking from the gas supply elements of the FSPA or any similar integrated solution would be that PREPA would not have the protections against delay or failure to deliver (of either the completed conversion project or delivered natural gas) which the FSPA affords it.

A “gas to power” project requires deep integration of the gas supplier and infrastructure provider to ensure that the fuel supply delivery system functions as expected from a safety, operational, and commercial perspective. Without a single point of responsibility, projects often experience significant delays and cost overruns, and some eventually fail and are abandoned. Where generating facility construction or conversion are separated from the fuel supply element in a gas-to-power project, there is created a “project on project” risk that often renders such projects unfinanceable and thus unachievable. The integrated nature of the FSPA, with the conversion works and the supply of delivered natural gas for the initial five year term being under the control and the responsibility of a single entity, offers PREPA the fundamental advantages of minimizing project delivery risk, shifting from PREPA the burden of financing a capital project up front, and a delivered natural gas price that is very substantially lower than the cost of continuing to consume diesel and lower than the delivered price that could be achieved if the SJ 5&6 conversion undertaking were decoupled from the delivered gas supply arrangement.

**Request 22**

**Has Mitsubishi confirmed that the units can be converted to burn gas or any other fuel (RFP, pg. 8, sec. 2.0)?**

The following response was provided by Jaime A. Umpierre Montalvo, Head of Engineering and Technical Services Division, PREPA. Jaime A. Umpierre Montalvo certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 22 The model 501F combustion turbines installed at the San Juan Power Station (San Juan Units 5&6) are designed to burn natural gas and are able to burn other types of fuel, such as diesel and propane. Mitsubishi has confirmed that the units can be converted to burn gas, propane and diesel. Works to complete the conversion of San Juan Units 5 & 6 to consume natural gas as well as diesel are underway. Mitsubishi is the contractor responsible for the completion of these conversion works, and is providing emissions and heat rate performance guarantees for unit operation on natural gas.

PREPA purchased the generating facilities incorporated in San Juan Units 5&6 configured to burn only diesel because there was no natural gas available in the San Juan Harbor area at the time the facilities were purchased. PREPA considered use of propane as an alternate fuel potentially suitable for use in San Juan Units 5&6 in 2011. After receiving preliminary hazard evaluations from insurance agencies, PREPA determined not to convert those units to consume propane because the San Juan Power Plant was

not designed and constructed for the use of propane in large volumes and as a result the conversion would entail high risks and would not be cost effective.

**Request 23**

**What is the status of permitting for the San Juan units 5&6 conversion project and the micro fuel handling facility? List all the federal and Puerto Rico permits required and the status of the permit applications, including application numbers and other identifying information. Provide copies of the permitting files.**

The following response was provided by Jaime A. Umpierre Montalvo, Head of Engineering and Technical Services Division, PREPA, and Matt Lee, Managing Consultant, Filsinger Energy Partners. Jaime A. Umpierre Montalvo and Matt Lee certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 23 The FSPA between NFEnergía and PREPA provides for the delivery of fuel (natural gas) at the San Juan Power Plant boundary. PREPA is not responsible for the design, permitting, construction, or operation of the Micro Fuel Handling (MFH) facility. Therefore, PREPA is unable to provide a list or copies of permits related to the MFH facility. It is PREPA's understanding that NFEnergía has or will soon secure requisite permits for the MFH facility and that the permitting was coordinated through the Puerto Rico Office of Permit Management (OGPe). PREPA understands that NFEnergía has obtained the following permits and authorizations:

1. USCG Letter of Recommendation, 16610, P405-18, September 26, 2018 (Exhibit LEO-PREPA ROI\_3\_06.pdf)
2. USCG, Department of Homeland Security, Temporary Final Rule (33 C.F.R. Part 165), Docket No. USCG-2019-0686, RIN 1625-AA00 (Exhibit LEO-PREPA ROI\_03\_12.pdf)
3. Certificación Proyectos Estratégicos, Junta de Planificación Oficina del Gobernador, No. PE-2018-78-002, 4 de mayo de 2018 (Exhibit LEO-PREPA ROI\_3\_23 Attach 1.pdf)
4. Permiso General Consolidado (PGN) 2018-23860-PGC-003797 (Exhibit LEO-PREPA ROI\_3\_23 Attach 2.pdf)
5. Environmental Quality Board Construction Permit (Air Permit) PFE-LC-65-0219-0108-II-C (Exhibit LEO-PREPA ROI\_3\_23 Attach 3.pdf)
6. Authorization of PREPA to present project to OGPE, Autorización y Titularidad 391476 9 de febrero de 2018 (Exhibit LEO-PREPA ROI\_3\_23 Attach 4.pdf)

PREPA is responsible for the permitting of San Juan Units 5 & 6 (SJ5&6) to allow for the dual-fuel conversion of the units, and PREPA has received the permits necessary to begin the conversion. The key permit for conversion and operation of SJ5&6 is contained in permit number PFE-65-0499-0365-I-II-C, which was issued by the Puerto Rico Department of Natural and Environmental Resources on October 3, 2019. PREPA has also obtained a determination that the proposed SJ5&6 conversion project will not result in significant impacts on the environment. See Ley 141, Evaluación Ambiental, No. 141-19-0193 (attached as Exhibit LEO-PREPA ROI\_3\_23 Attach 5.pdf).

The conversion of SJ5&6 is not subject to Federal Prevention of Significant Deterioration (PSD) regulations, as the conversion will not result in a “significant increase” in emissions. The United States Environmental Protection Agency (USEPA) has reviewed the PSD Non-Applicability Analysis for SJ5&6, and a copy of USEPA’s response is attached for convenience (Exhibit LEO-PREPA ROI\_3\_23 Attach 6.pdf).

**Request 24**

**How does the micro fuel handling facility relate to the land-based LNG project?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 24 The micro fuel handling facility is currently being constructed by NFEnergía and will be owned and operated by that entity. The land-based LNG project described in the IRP Main Report is presented as one potential means of supporting receipts of LNG and deliveries of natural gas to both San Juan Units 5&6 and a new gas-fired combined cycle combustion turbine that may be constructed at the existing Palo Seco generating facility site. There is not necessarily any relationship between the two projects. It is possible that a new land-based LNG receiving facility could be developed for the purpose of supplying the San Juan 5&6 generating facilities as well as a new Palo Seco generating facility; if so, this facility might supplant the micro fuel handling facility as the source of natural gas that would be consumed in San Juan Unites 5&6 (in this case, the micro fuel handling facility would presumably remain in place and operational to the support truck and ISO container loading operations for which the micro fuel handling facility was originally developed). It may also be possible that the micro fuel handling facility could be expanded so that it would have the capacity to supply natural gas to San Juan 5&6 and a new Palo Seco generating facility; in this case, the micro fuel handling facility would take on the functions the IRP describes the land-based LNG facility in San Juan Harbor as performing.

**Request 25**

**Indicate and explain whether the CO2 emission rate in Exhibit 8-21 includes emissions from revaporization / regasification.**

The following response was provided by Matt Lee, Managing Consultant, Filsinger Energy Partners. Matt Lee certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 25: The fuel supply contract between NFE and PREPA is for the supply of natural gas at the San Juan Power Plant boundary. Therefore, emissions associated with regasification for natural gas supplied to SJ5&6 are not included in Exhibit 8-21. Please note that for new combined-cycle gas turbine generators (CCGTs) listed in Exhibit 8-21 and 8-22, it is assumed that regasification will be an integral part of the mass and energy balance for the system. What this means is that inlet air chilling for the gas turbines would provide the energy required for the regasification of natural gas. External energy sources would only be required for start-up and shutdown.

**Request 26**

**Please provide the estimated change in greenhouse gas emissions, both per MWh and annually, that will result from conversion of San Juan 5 & 6. Please include all emissions from revaporization/regasification in those estimates.**

The following response was provided by Matt Lee, Managing Consultant, Filsinger Energy Partners. Matt Lee certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 26: As presented in the metrics files for the ESM Plan, CO2 emissions associated with natural gas combustion in SJ5&6 are estimated at 852 lbs/MWhr (average 2020 through 2024). As a comparison, the model assumes 1,335 lbs/MWhr of CO2 for diesel fuel-fired CCGTs. Average emissions for CO2 from SJ5&6 were modeled at 667,374 tons per year between 2020 and 2024.

PREPA does not have information related to the design or fuel consumption of the regasification units, as they are part of NFE's MFH facility. Therefore, PREPA is unable to provide CO2 emissions estimates related to regasification.

**Request 27**

**Does the IRP assume that substantial amounts of renewables cannot be incorporated into the grid without**

**new fossil generation? New Combined Cycle Units  
burning gas?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 27: Thermal generation is required in PREPA for the following reasons. Thermal generation is necessary in PREPA to:

- Maintain the stability in the system.
- Supply part of the load serving needs in periods where renewable resources fail to provide for the load
- Provide responsive reserves
- Provide generation specific to serving the needs of the mini-grids in the event of a catastrophic event such as a hurricane like Maria.

The question of which thermal generation to select is based on operating capability, locational need and cost. These are expected to change as technology changes but will likely be dictated by generation developers and PREPA.

**Request 28**

**Provide the documents on the status of conversations with EPA concerning the Mercury and Air Toxic Standards (MATS).**

The following response was provided by Luisette Ríos Castañer, Head Environmental Protection and Quality Assurance Division, PREPA. Luisette Ríos Castañer certifies that, to the best of her information and belief, all answers provided by her herein are true and no false or misleading information has been provided.

**Response:** Request 28 The Units at each Plant that are subject to MATS are in compliance with the major MATS obligations, as outlined below. PREPA is in negotiations with EPA and the Department of Justice to resolve issues regarding its MATS compliance, and to develop and implement an extensive Clean Air Act Compliance Program.

Aguirre Plant: Units 1 and 2 are subject to MATS.

- Unit 1 is in compliance with the following major MATS requirements: (i) emissions limits imposed for particulate matter ("PM") and demonstrated through quarterly

performance testing; (ii) fuel moisture content no greater than 1.0 % by weight; and (iii) tune-up practice standards.

- Unit 2 has been out of service since April 8, 2019. Prior to being removed from service, Unit 2 was in compliance with the following MATS requirements: (i) fuel moisture content no greater than 1% by weight; and (ii) Work Practice Standards.

Costa Sur Plant: Units 3, 4, 5, and 6 are subject to MATS.

- Unit 3 (limited use unit) has been out of service since August 2016. ‘
- Unit 4 (limited use unit) has been out of service since December 2016.
- Unit 5 is in compliance with the following major MATS requirements: (i) emissions limits imposed for PM demonstrated through PM Continuous Emissions Monitoring System; (ii) fuel moisture content no greater than 1.0 % by weight; (iii) tune-up practice standards and startup and shutdown work practice standards (hereinafter, “Work Practice Standards”); and (iv) the outages and quality assurance program.
- Unit 6 is in compliance with the following major MATS requirements: (i) emissions limits imposed for PM demonstrated through PM Continuous Emissions Monitoring System; (ii) fuel moisture content no greater than 1.0 % by weight; (iii) Work Practice Standards; and (iv) the outages and quality assurance program.

Palo Seco Plant: Units 1, 2, 3, and 4 are subject to MATS.

- Unit 1 (limited use unit) is in compliance with the following major MATS requirements: (i) heat input-based limit of 8%

annual capacity factor; (ii) fuel moisture content no greater than 1.0 % by weight; and (iii) Work Practice Standards.

- Unit 2 has been out of service since December 2016.
- Unit 3 is in compliance with the following major MATS requirements: (i) fuel moisture content no greater than 1.0 % by weight; and (ii) Work Practice Standards.
- Unit 4 has only been in service for less than a month (May 22-June 21-2019) since 2016. In that short window of operations, Unit 4 was in compliance with (i) fuel moisture content no greater than 1.0 % by weight; (ii) Work Practice Standards; and (iii) the outages and quality assurance program.

San Juan Plant: Units 7, 8, 9, and 10 are subject to MATS.

- Unit 7 (limited use unit) is in compliance with the following major MATS requirements: (i) fuel moisture content no greater than 1.0 % by weight; and (ii) Work Practice Standards.
- Unit 8 (limited use unit) is in compliance with the following major MATS requirements: (i) heat input-based limit of 8% annual capacity factor; (ii) fuel moisture content no greater than 1.0 % by weight; (iii) Work Practice Standards.
- Unit 9 is in compliance with the following major MATS requirements: (i) fuel moisture content no greater than 1.0 % by weight; (ii) Work Practice Standards; and (iii) the outages and quality assurance program.
- Unit 10 has been out of service since March 2016.

**Request 29**

**What is PREPA's projected annual LNG demand for the Palo Seco plant? Please provide that analysis and all supporting documentation.**

The following response was provided by Peter Hubbard, Manager Siemens PTI EBA. Peter Hubbard certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 29 Several of the scenarios call for a 302 MW F-Class CCGT to be built at Palo Seco by 2025. With a heat rate of 7.25 MMBtu/MWh, the annual fuel

consumption of this F-class unit at Palo Seco at a 100% load factor would be 19.2 Bcf/year or 0.4 MMtpa.

**Request 30**

**What is the status of the Yabucoa LNG project? Please provide all supporting documentation.**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 30 The Yabucoa LNG project is one of the resource additions included as an option in the Energy System Modernization Plan and the Action Plan that has emerged from the IRP process. As noted in the IRP Main Report, the Yabucoa LNG project (consisting of an LNG receiving facility and a new 302 MW combined cycle gas turbine) would be developed as a hedge against resource development and deployment uncertainties. The basis for this approach is described at Section 1.2 of the IRP Main Report:

Siemens recommends that PREPA proceed with the preliminary permitting and planning activities for the Yabucoa CCGT and the Mayagüez Peaker conversion together with their associated ship-based LNG delivery infrastructure, in addition to the new CCGT at Cost Sur. The intent would be that, prior to making any large contractual commitments for equipment purchase or construction for these projects, PREPA would reassess which combination of these project provide best option for the PREPA system. Proceeding with only the preliminary permitting and planning activities for each of these project preserves PREPA's ability to select either the plan described by ESM, S4S2 or S4S2S9 depending on the future circumstances. Proceeding with the preliminary activities for these projects will provide PREPA approximately two years to three years to allow some of the uncertainties to be resolved and formulate a clearer understanding of the potential need for the projects.

No development activities or requests for information relating to the Yabucoa LNG project have yet been initiated.

**Request 31**

**What is the status of the Mayaguez LNG project? Please provide all supporting documentation.**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 31 The Mayagüez LNG project is among the resource additions included as an option in the Energy System Modernization Plan and the Action Plan that has emerged from the IRP process. As noted in the IRP Main Report, the Mayagüez LNG project (which would consist of the conversion of 200 MW of existing combustion turbine peaking units to consume natural gas, as well as the development of an LNG receiving facility) would be developed as a hedge against resource development and deployment uncertainties. See the preceding response for an explanation of the rationale underlying this approach.

By Request for Information issued May 30, 2019 (PREPA RFI No. 93156, Natural Gas Supply for Mayagüez Power Plant), PREPA solicited feedback and recommendations from the fuel supply industry for the supply of gasified natural gas for consumption at PREPA's existing Mayagüez Power Plant. PREPA has received eight responses to this Request for Information. It is currently developing a Request for Proposals that will invite project proponents to offer proposals for the development of the required LNG and natural gas infrastructure and the conversion of the existing Mayagüez peaking units.

**Request 32**

**Please refer to PREPA's answer to PREB-PREPA-04-24:**

- a) Has PREPA considered the ability to deliver fuel to gas-fired plants during extreme weather events?
- b) Has PREPA considered potential increased costs for delivering fuel to these plants during extreme weather events?

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 32 a) PREPA is aware of the importance of ensuring that natural gas can be delivered to gas-fired generating facilities during extreme weather events. It has contracted for the delivery of natural gas to its Costa Sur and San Juan 5&6 facilities on a firm basis in accordance with nominations PREPA will provide to the suppliers from time to time, and in this way has obligated the suppliers to take such measures as may be required to ensure that adequate quantities of LNG are available in storage adjacent to the Costa Sur and San Juan 5&6 generating facilities to support natural gas use in the generation of power during extreme weather events. In addition, PREPA has maintained the ability to consume diesel or other petroleum-based fuels in the Costa Sur and San Juan Units 5&6 in the event that natural gas becomes unavailable, whether because of adverse weather conditions or LNG facilities upsets. Such diesel supplies will be held in storage at the generating facility sites, or will be delivered to the generating sites from remote storage by pipeline. Deliveries of fuel from local storage or by pipeline is highly unlikely to be interrupted for any sustained period of time by an extreme weather event.

The analyses referenced in the response to PREB-PREPA-04-24 assume that all critical loads within individual Minigrids are covered by thermal resources as a means of ensuring system resilience in the face of extreme weather events (e.g., hurricane or tropical storm conditions, which typically include heavy rain for sustained periods). In such conditions, (i) solar generation resources are likely to be incapable of generating at anywhere close to their rated capacity, and may be damaged in a manner that limits their capability even following the conclusion of the event, (ii) wind generation resources may need to be taken offline and may sustain damage limiting their availability post-event, and (iii) battery energy storage systems are likely to be discharged during and immediately following the event and unavailable as reliable sources of energy for some period thereafter. In such conditions, thermal resources with supplies of fuel available in storage on-site (such as LNG or diesel in tanks at the generating facility site), or for delivery by pipeline from a source of stored fuel, are more likely to be available and capable of serving critical loads during and immediately following an extreme weather event than non-thermal resources, such as solar, wind and battery energy storage facilities. The thermal resources assumed to be available to serve critical loads in the analysis shown at page 2-18 of Appendix 1 will all have on-site or proximate fuel storage or access to fuel storage by pipeline, and therefore (assuming fuel inventories in storage are properly managed) will be able to be dispatched on during and for some period following an extreme weather event while drawing on stored fuel supplies. The operation of these resources during and for some period following an extreme weather event therefore should not be affected by a weather-related interruption in deliveries of natural gas from remote sources of supply..

Request 32 b) PREPA's natural gas supply agreements prescribe commodity prices that are derived from published indices as well as stated delivery cost components. The obligation to deliver natural gas to PREPA's generating facilities in accordance with the gas supply agreements, including the pricing provisions, is the fuel supplier's (Naturgy, in the case of Costa Sur, and NFEnergía in the case of SJ 5&6), and the suppliers bear the cost of delivering fuel to the generating facilities. PREPA's gas supply agreements do not include provisions that would permit the supplier to impose a surcharge or otherwise pass on directly to PREPA increased delivery costs resulting from extreme weather events. PREPA could confront some increase in the cost of fuel consumed in its gas-fired generating facilities in the event it is required switch to diesel or other petroleum fuel because natural gas is temporarily unavailable, whether by reason of adverse weather events or otherwise.

**Request 33**

**Is PREPA aware of any offtakers who have made commitments to take gas from PREPA's proposed terminals?**

The following response was provided by James F. Bowe, Jr., Partner, King & Spalding LLP. Mr. Bowe certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 33 PREPA is not aware that any offtakers have made commitments to take gas from LNG terminals that may be developed to provide natural gas supply to existing or proposed gas-fired generating facilities in Puerto Rico. PREPA is aware that NFEnergía intends to supply LNG by means of truck and ISO containers from the micro fuel handling facility it is currently constructing; PREPA has no knowledge as to the identity of any entities that may have contracted for supplies of LNG that will be delivered through the NFEnergía micro fuel handling facility.

**Request 34**

**Refer to the New Fortress contract, which includes the following costs for gas:**

**Fuel Sale and Purchase Agreement NFE Contract Exhibit C - Fuel Price**

**Unit Cost:**

**Transitional supply period and months 1-12 of initial contract term of \$8.50/MMBtu (base cost)**

**\$7.50/MMBtu for months 13-24 of the Initial Contract Term**

**\$6.50/MMBtu for months 25 until the end of the Initial Contract Term**

**During any extension term -- an amount per MMBtu to be agreed upon**

**Unit Fuel Cost: Gas Index Price x 115%=\$12 MMBtu Plus \*NG**

**Manufacturing Surcharge \$50M \$833,000 per month**

**For the IRP, Siemens modeled natural gas as 115% of Henry Hub plus \$4.35 per MMBtu. Please provide a detailed explanation of the difference between Siemens' modeled costs for gas, and the New Fortress Contract's costs for gas.**

The following response was provided by Peter Hubbard, Manager Siemens PTI EBA. Peter Hubbard certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 34 The formula of 115% of Henry Hub plus a \$4.35/MMBtu adder is based on current contracting practices at Sabine Pass, Freeport LNG, and other Gulf

Coast liquefaction facilities. Many of these existing LNG contracts are based on a 15% adder to the Henry Hub price index, plus an additional tolling fee for liquefaction. Siemens assumed a \$2.80/MMBtu tolling fee for liquefaction. Once the LNG is free on board, Siemens assume a \$1.00/MMBtu round trip transportation to Puerto Rico, plus \$0.55/MMBtu for margin (profit). The 115% Henry Hub + \$4.35/MMBtu adder represents a liquid and competitive LNG market price point and assumes that Puerto Rico will be successful in seeking a waiver to the Jones Act. The information provided in this question regarding the New Fortress Energy contract would appear to indicate the commercial price structure is factoring in higher costs and/or risks during the initial few years, compared with a level adder of \$4.35/MMBtu for the model.

**Request 35**

**What is the annual volume of coal combustion residuals and/or Agremax (CCRs) that the AES Puerto Rico plant generates?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 35 Please refer this question to AES.

**Request 36**

**What is the volume of AES CCRs at the AES plant site?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 36 Please refer this question to AES.

**Request 37**

**What are the terms of the contract between AES and PREPA as to the CCRs?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 37 Please refer to the AES contract second amendment for the terms of the contract between AES and PREPA as to the CCRs. Copy of the second amendment can be downloaded at:

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<https://aeepr.com/es-pr/QuienesSomos/Paginas/ContratoIndex.aspx>.

**Request 38** **Are there any circumstances under which PREPA would be required to pay for the disposal or handling of the AES CCRs?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 38 Please refer to article 20 of the AES contract. Copy of the contract can be downloaded at:

<https://aeepr.com/es-pr/QuienesSomos/Paginas/ContratoIndex.aspx>.

**Request 39** **Blank**

**Request 40** **Is the cost of the handling and/or disposal of the CCRs embedded in the AES charge pursuant to the Power Purchase and Operation Agreement (PPOA) between PREPA and AES?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 40 Yes, however, the contract does not specify under which type of charge (Demand or Fixed). PREPA considers this type of charge as a Fixed Expense. It should be covered by the Fixed O&M charge defined in the contract.

**Request 41** **Has AES made any attempt to charge PREPA for the handling, disposal of the CCRs?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 41 No.

**Request 42**

**What are the constituents of the AES CCRs?**

- a) Have the constituents of the AES CCRs leached into the groundwater?**
- b) Does the CCR or Agremax pile at the AES plant site generate fugitive dust?**
- c) Are there any circumstances under which PREPA would be required to pay or contribute to the cost for the cleanup or remediation of the groundwater contaminated by the CCRs/Agremax?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 42 Please refer this question to AES.

Request 42 a) Please refer this question to AES.

Request 42 b) Please refer this question to AES.

Request 42 c) No, AES is responsible for these costs.

**Request 43**

**Has Fluence, the joint venture created by AES and Siemens Industry participated in requests for proposals, requests for qualifications and/or bidding for electric system equipment or services in Puerto Rico? If so, please provide the documents.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting Siemens PTI. Nelson Bacalao certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 43: All Siemens Industry Inc. Power Technologies International (Siemens PTI) personnel engaged in the IRP has stopped any contacts with Fluence in connection with Puerto Rico, hence we ignore if they have or have not participated in any process.

**Request 44**

**Does Siemens Industry have other contracts with PREPA in addition to the IRP contract? If so, please list them and provide copies.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 44: The information requested is not available at this moment. PREPA will provide the requested information as soon as it becomes available.

**Request 45**

**Has Siemens Industry participated in requests for proposals, requests for qualifications and/or bidding for electric system equipment or services in Puerto Rico? If so, please provide the documents.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 45: The information requested is not available at this moment. PREPA will provide the requested information as soon as it becomes available.

**Request 46**

**Does Siemens Industry sell combined cycle electric generation units and other electric industry equipment called for in the draft IRP?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 46: Combined cycle electric generation units and other electrical industry equipment are products of Siemens Energy which is a sister company albeit separated with fire walls and independent in responses to RFPs and RFQs. Siemens Industry Inc. Power Technologies International (Siemens PTI) personnel engaged in the IRP has severed contact with other sister companies any dealings with Puerto Rico.

**Request 47**

**Has Siemens or PREPA considered carbon pricing scenarios? If so, provide the documentation.**

The following response was provided by Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Jack Henry certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 47 Carbon pricing was not included in the original scope of work. As a response to questions from the PREB, PREB-PREPA-06-03 requested carbon pricing analysis on three scenarios. The documentation can be found in the response to that ROI.

**Request 48**

**At the September 4, 2019 Initial Technical Hearing<sup>1</sup>, Dr. Bacalao explained that PREPA Transmission and Siemens had identified a number of substations with strong transmission capability, that could accommodate additional interconnections for renewable resources.**

- a) Please provide that list of substations, with the location of each substation, and the amount of additional MW of interconnection capability each can accommodate.
- b) Dr. Bacalao explained that next, Siemens and PREPA conducted mapping, assigning a certain amount of renewable resources to some of these substations. Please provide those mapping documents, and all supporting documentation.

The following response was provided by Jack Henry, PE, Senior Staff Consultant and Nelson Bacalao, PhD, Senior Manager Consulting, Siemens PTI. Jack Henry and Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 48 a) The initial mapping was determined by looking at the getaway at strong buses in the PREPA system. This was done to minimize the number of actual modeling nodes to be used in the IRP. The actual location of new renewable installations is unknown until developers select locations. It should be noted that any location selected by a developer will require impact/facility studies to determine the impacts at the interconnection point and across the system. Any interconnection will need to comply with interconnection standards.

Siemens PTI and PREPA reviewed the list of strong nodes and selected a subset of those nodes which are best suited for resource modeling for the IRP. The list provided shows

the new buses modeled in the PREPA system, where the buses inject power at the high voltage level and how much generation might be injected at those new buses. The new buses modeled include nodes for Distributed Generation (these were modeled at a representative location rather than focusing on actual interconnections at the distribution feeder level), new Renewable Resources and new Thermal resources. Please refer to file LEO-PREPA ROI\_3\_48 Attach 1.xlsx.

Request 48 b) The mapping of new generation facilities from the LTCE runs was mapped to the generator bus models determined by the Minigrids and then spreading the installations between the generator buses in those Minigrids.

**Request 49**

**Provide documents concerning the land availability for utility scale renewable energy projects in Puerto Rico considerations mentioned by Mr. Bacalao in his testimony at the Initial Technical Conference.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 49: We understand that utility scale PV can be located in land designated Rustico Comun, the figure below shows the areas in PR with this zone type (brown) and the table also below indicates that if all this area were utilized more than 58 GW of PV could be installed considering 7.5 Acres per MW. Finally, in the figure below the green rectangles show a potential location of 2,600 MW of PV.

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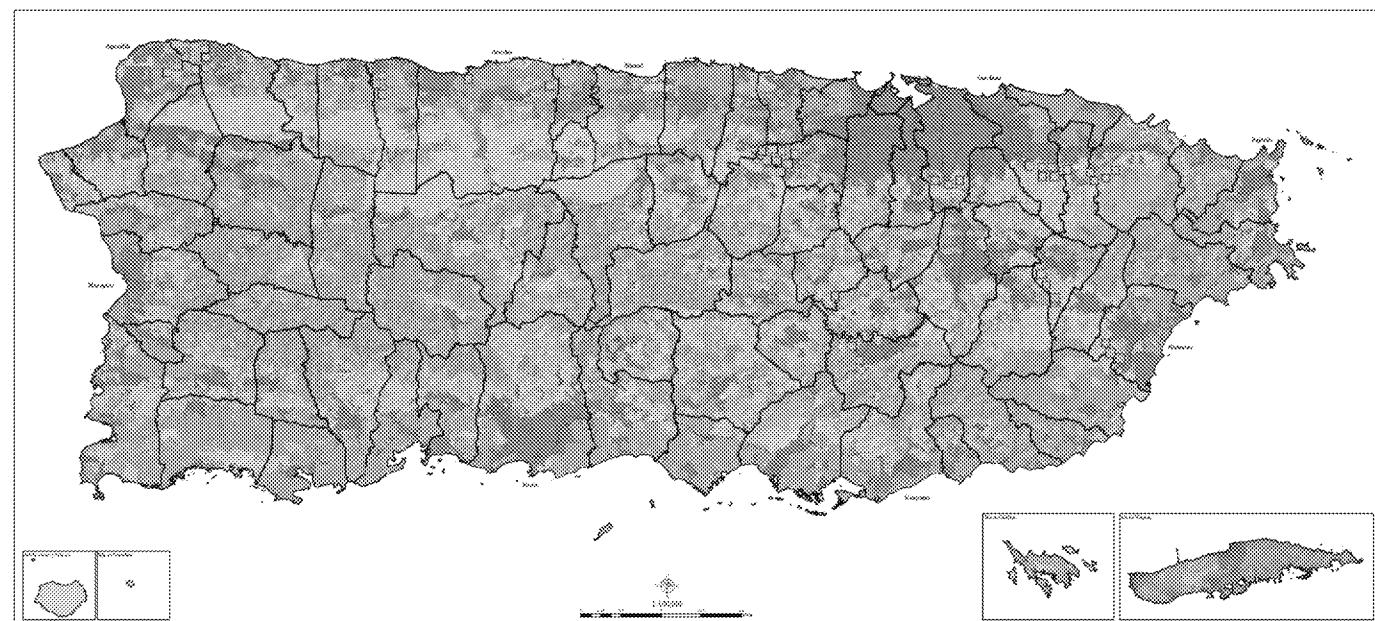
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Table 1: Coverage of land by type and amount of PV that could be located

Zona	Descripción	Area M <sup>2</sup>	Cuerdas	Acres	MW pv @ 7 Acres/ 1 MW	MW PV @ 7.5 Acres/ 1 MW
AGUA	Agua	102,768,026.32	26,149.63	25,394.51	3,627.79	3,385.93
SRC	Suelo Rústico Común	1,789,114,054.86	455,245.31	442,099.32	63,157.05	58,946.58
SREP	Suelo Rústico Especialmente Protegido	110,728,480.40	28,175.19	27,361.58	3,908.80	3,648.21
SREP-A	Suelo Rústico Especialmente Protegido Agrícola	2,329,417,847.63	592,727.19	575,611.18	82,230.17	76,748.16
SREP-AE	Suelo Rústico Especialmente Protegido Agrícola y Ecológico	53,419,815.97	13,592.83	13,200.31	1,885.76	1,760.04
SREP-AH	Suelo Rústico Especialmente Protegido Agrícola e Hídrico	116,195,201.79	29,566.21	28,712.43	4,101.78	3,828.32
SREP-AP	Suelo Rústico Especialmente Protegido Agrícola y de Paisaje	6,957,529.25	1,770.36	1,719.24	245.61	229.23
SREP-E	Suelo Rústico Especialmente Protegido Ecológico	1,795,065,584.76	456,759.69	443,569.97	63,367.14	59,142.66
SREP-EA	Suelo Rústico Especialmente Protegido Ecológico y Agrícola	29,444,187.17	7,492.16	7,275.81	1,039.40	970.11
SREP-EH	Suelo Rústico Especialmente Protegido Ecológico e Hídrico	611,203,528.92	155,522.53	151,031.55	21,575.94	20,137.54
SREP-EP	Suelo Rústico Especialmente Protegido Ecológico y de Paisaje	194,278,727.46	49,434.79	48,007.28	6,858.18	6,400.97
SREP-H	Suelo Rústico Especialmente Protegido Hídrico	69,650,703.76	17,722.83	17,211.05	2,458.72	2,294.81
SREP-P	Suelo Rústico Especialmente Protegido de Paisaje	44,338,520.35	11,282.07	10,956.28	1,565.18	1,460.84
SU	Suelo Urbano	1,190,638,289.31	302,961.40	294,212.87	42,030.41	39,228.38
SURNP	Suelo Urbanizable No Programado	26,991,811.43	6,868.15	6,669.82	952.83	889.31
SURP	Suelo Urbanizable Programado	41,695,542.29	10,609.55	10,303.18	1,471.88	1,373.76
VIAL	Vial	364,968,247.00	92,867.24	90,185.54	12,883.65	12,024.74

Figure 1: Land Use Map of Puerto Rico (Brown =Rustico Comun)



**Request 50 Provide the documentation, including the forecast which shows how Siemens and/or PREPA calculated the cap on customer-owned generation at 1176 MW.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 50 It is not a cap; it is the final value of the forecast. See response to PREB ROI 1 – 18 – c for further details on the forecasting model.

<b>Request 51</b>	Provide documentation on any assessments or evaluations of the remaining life, and the operation and maintenance costs to continue operating, PREPA's existing peaking units.
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The following response was provided by Daniel Hernandez Morales, Director of Generation, PREPA. Daniel Hernandez Morales certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 51: There are no useful service life studies on the current fleet of Frame 5 units, as they are already well past their service life as per industry standards. They are being kept in service and maintained due to their need in the electric grid, while their replacement takes place. Please refer to LEO-PREPA ROI\_3\_51 Attach 1.pdf for an updated report on availability and estimated operation years before their next major overhaul, based on their actual usage per year.

**Request 52 Does PREPA plan to establish any program to incentivize customer-owned generation?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 52 The main incentive for customer-owned generation in Puerto Rico is the Net Metering Program established by Act 114-2007 as amended. It provides significant incentives for customers to install renewable energy systems in their premises.

Act 83-2010, as amended, includes financial incentives for certain types of customer owned generation. The regulations on microgrids and wheeling being worked on by the Puerto Rico Energy Bureau will also incentivize customer-owned generation. PREPA provides regulations addressing interconnection procedures and requirements to cover technical aspects and facilitate the interconnection of such systems.

**Request 53**

**Are interconnection procedures the same for utility scale renewable energy systems and customer-owned generation? Please explain your response. Explain the PREPA-specific cost for interconnection. How does that compare with rooftop solar and customer self-supply?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 53 Interconnection procedures for utility scale renewable energy systems and customer owned generation are not the same, as there are important differences in capacity, interconnection requirements and modes of operations between these two types of systems. Interconnection requirements for customer owned generation are specified in the corresponding PREPA regulations. Interconnection requirements for utility scale renewable energy systems are established in the corresponding contract.

**Request 54**

**Please refer to Exhibits 8-37 and 8-38. Provide the estimated annual costs of customer-owned generation and PREPA rates.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 54 The exhibits in reference were designed to perform a comparison of rates, not to estimate the annual costs. Such exercise is beyond the scope of the IRP as it depends heavily on the consumption patterns of each customer.

**Request 55**      **How was the non-generation (Non-Fuel + Power Purchase) rate calculated at 14.2 cents per kWh in the IRP?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 55 This value was not calculated in the IRP but it was provided as an estimation of other costs by PREPA's financial advisors. The cost includes the total transmission and distribution costs and administrative charges and hence beyond the values assessed in the IRP.

**Request 56**      **Does Siemens assume that customer-owned generation will remain connected to the PREPA system?**

- a) If so, provide all analysis and documentation supporting that assumption.
- b) Did Siemens account for the possibility that customer-owned generation would include storage? If so, please provide all analysis and documentation supporting that assumption.

The following response was provided by Nelson Bacalao, PhD, Senior Manager, Consulting, and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 56 Siemens PTI assumed that customer-owned generation would remain connected to the PREPA system and this is based on the premise that: a) the IRP will result in a reliable and resilient system, b) net-metering will continue for the foreseeable future so customers can use PREPA's system as a zero cost storage; inject the energy during the day and extract it at night with full compensation.

Request 56 a) See response above.

Request 56 b) Conservatively we did not assume any customer owned storage thus ensuring that there would be provisions for this storage at the utility level. Moreover, for

the reasons explained in the response above under the conditions the IRP is to create there would be little incentive for customer owned storage.

**Request 57 How much of the existing or proposed energy infrastructure is in flood prone areas?**

- a) Please provide all documents related to sea level rise, storm surge, or other flooding risk Siemens and/or PREPA reviewed during the preparation of this IRP.
- b) Please explain how, if at all, those documents influenced the choice of locations for new power plants and/or the decision to convert existing plants.

The following response was provided by Nelson Bacalao, PhD, Senior Manager, Consulting, Siemens PTI Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Nelson Bacalao and Efran Paredes Maisonet certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 57 This analysis is outside the scope of the IRP. Siting considerations for the proposed energy infrastructure are evaluated as part of the engineering design phase of each new project. As part of the upgrades needed to PREPA's substations, 19 were identified as needing relocation or reinforcement because these were flooded after hurricane Maria.

Request 57a) As stated above, this analysis is outside the scope of the IRP.

Request 57 b) As stated above, this analysis is outside the scope of the IRP.

**Request 58**

**Provide the PREPA plan to address the Yabucoa plant overloads and information on constraints as a result of two major resources, 302 MW each at Yabucoa and Mayaguez and the reinforcements required in existing system steady state analysis.**

The following response was provided by Yan Du Staff Consultant of Siemens PTI. Yan Du certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 58 The detailed analysis is described in Section 3.5 of the IRP Appendix 1-Transmission & Distribution. To reiterate here:

Contingency analysis was conducted for the unreinforced system. This system represents what is currently existing and operating as PREPA's transmission network. The purpose of this study is to mainly identify any constraints and reinforcements required to relieve those constraints as a result of two major resources, not counting on the investments in the MiniGrids. These units are 302 MW each interconnected to Yabucoa and Mayaguez.

Two power flow cases, bench (without the units) and study (with the units), were created to run the contingency analysis. In study case the new units were dispatched to full capacity, and the generation in the rest of PREPA system was adjusted to maintain the same generation level.

The unit in Mayaguez did not result in any constraints. The unit in Caguas (Yabucoa) results in some overloads. These overloads would not exist considering the reinforced case for MiniGrid operations. Also there is a possible plan in place to reroute one of the two lines from AGUIRRE to AGUAS BUENAS and terminate to AES, thus providing another outlet for AES units, and this would also resolve all the overload issues.

**Request 59**

Indicate and explain the status of all the PREPA fleet electric generation plants as to the requirements of the Clean Water Act.

- a) Please also provide the status of the AES Guayama plant's compliance with the Clean Water Act requirements.
- b) Please also provide the status of Ecoelectrica's compliance with the Clean Water Act requirements.

The following response was provided by Luisette Ríos Castañer, Head Environmental Protection and Quality Assurance Division, PREPA. Luisette Ríos Castañer certifies that, to the best of her information and belief, all answers provided by her herein are true and no false or misleading information has been provided.

**Response:** Please refer to PREPA's response to Local Environmental Organization's Second ROI Request 14 for the status of PREPA's generation plants as to the requirements of the Clean Water Act.

Request 59 a) This question should be addressed to AES.

Request 59 b): This question should be addressed to EcoEléctrica.

**Request 60**

**Please provide an update to Exhibit 4-24, on the status of the CAA nonattainment for SO<sub>2</sub> of the generation plants.**

- a) What is the compliance status of other air pollutants emitted by the PREPA fleet generation plants?**
- b) What is the compliance status of other air pollutants emitted by AES and Ecoelectrica?**

The following response was provided by Luisette Ríos Castañer, Head Environmental Protection and Quality Assurance Division, PREPA. Luisette Ríos Castañer certifies that, to the best of her information and belief, all answers provided by her herein are true and no false or misleading information has been provided.

**Response:** Request 60 a) Please refer to PREPA's response to Local Environmental Organization's Second ROI Request 14 for the compliance status of PREPA's plants.

Request 60 b) This question should be addressed to AES and EcoEléctrica.

**Request 61**

**Explain and provide documentation on the percentage of electric power outages in Puerto Rico that are due to transmission failures.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 61 The information requested is currently not available. PREPA will provide the information as soon as it becomes available.

**Request 62**

**Explain and provide documentation on the percentage of electric power outages in Puerto Rico that are due to distribution failures.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best

of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 62 The information requested is currently not available. PREPA will provide the information as soon as it becomes available.

**Request 63**

**Why are none of the PREPA units equipped with Continuous Emissions Monitoring Systems (CEMS)?**

The following response was provided by Luisette Ríos Castañer, Head Environmental Protection and Quality Assurance Division, PREPA. Luisette Ríos Castañer certifies that, to the best of her information and belief, all answers provided by her herein are true and no false or misleading information has been provided.

**Response:** Request 63 CEMS are installed only at PREPA units where permits or regulations require it – San Juan and Cambalache units.

**Request 64**

**Is AES equipped with CEMS?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 64 PREPA understands that AES is equipped with CEMS. Please refer this question to AES for confirmation.

**Request 65**

**Please provide any information currently in PREPA's possession about the projects awaiting interconnection to PREPA's system. This information should include size, type, timing, interconnecting party, status of interconnection, etc.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 65 The information requested is currently not available. PREPA will provide the information as soon as it becomes available.

**Request 66** Please provide the spreadsheet used to develop Table D.1 of Appendix 4

The following response was provided by Marcelo Saenz, Senior Consultant, Siemens PTI. Marcelo Saenz certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Appendix 4 of the IRP has Exhibits, not tables. Please clarify or provide title of the exhibit in reference.

**Request 67** Please provide the S4S2B workpaper.

The following response was provided by Marcelo Saenz, Senior Consultant, Siemens PTI. Marcelo Saenz certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 67 There is no such workpaper; however in the filed workpapers please refer to workpaper titled: S4S2B\_Metrics\_Base Case SII.xlsx

**Request 68** Please provide the spreadsheets used to develop the capital cost inputs for all new and converted resources modeled in Aurora with all formulas and links intact.

The following response was provided by Marcelo Saenz, Senior Consultant, Siemens PTI. Marcelo Saenz certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 68: This question is quite wide, however there are filed workpapers that may address these questions; PREPA IRP Solar Wind Storage Costs-Updated CF-Wind-final.xlsm for renewable and PREPA Fossil New Resources 10-9 2018\_v6.2.xlsx for new thermal.

**Request 69** Please explain why the NPVs given in “Summary PREPA IRP Cases-06032019” and throughout the IRP are not consistent with the NPVs calculated in the corresponding workpapers for those runs. For example, the “Summary” spreadsheet shows an NPV with and without Energy Not Served of \$14,698,161 and \$14,431,214, respectively. In comparison, the “ESM\_Metrics\_Base\_SII-mm with action plan tab” shows an NPV of \$15,403,559. (All figures are in 000\$.) If the difference is due to some additional

**transformation of the system costs please provide that transformation in spreadsheet format with all formulas and links intact.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 69 As can be observed by following the calculations, the NPV (both with and without the energy not served) are determined in the tab “Production Costs” Looking at that tab we see the following:

	ESM
NPV fuel	5,875,910
NPV Var O&M	358,888
NPV Fixed Costs	8,196,415.27
Total	<b>14,431,214</b>

And we also have:

NPV @ 9% 2019-2038 \$000	Average 2019-2028 2018\$/MWh	RPS 2038	NPV Deemed Energy Not Served MiniGrid Ops \$000 (1)	NPV + ENS \$000
14,431,214	98.91	66.99%	266,947	14,698,160

So the value in the summary and the ESM document are consistent with the calculated values in the workpapers.

**Request 70**

**Please list the steps PREPA has taken to reduce non-technical losses and the estimated improvement in those losses resulting from those steps.**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best

of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 70 The information requested is currently not available. PREPA will provide the information as soon as it becomes available.

**Request 71**

Models like AURORA are often set up to optimize capacity expansion relative to a market price and subject to optimization constraints like a minimum reserve margin. Meaning that all resources that the model is capable of adding are added if they are “profitable” subject to the constraints on the objective function like the reserve margin. Please answer the following:

- a) Did Siemens use AURORA in this manner?
- b) If so, what market price did it use?
- c) If so, provide that market price and any workpapers used in its development with all formulas and links intact.
- d) If not, how would Siemens describe the optimization?

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 71a) The objective that was used is to minimize the present value of the total production costs that includes both amortization of capital costs, fixed and variable O&M and fuel costs, subject to constraints that may be binding, i.e. driving the results and preventing the further reduction on the objective (e.g. meeting the load and the RPS) or not binding and not affecting the objective’s minimization (e.g. reserves).

Request 71 b) Not applicable for the methodology used.

Request 71 c) Not applicable for the methodology used.

Request 71 d) See Response 71 a).

**Request 72**

**Under the ESM, the reserve margin never falls below 53% and is often at least 10 percentage points higher than that. Why did Siemens choose not to retire additional units or exclude the construction of new units so as to make the reserve margin closer to its minimum requirement of 30%?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 72 As can be observed above the optimization was done to minimize the present value of the total costs. Thus, at any point in time the optimization process is assessing the benefits of maintaining unit online (lower variable costs) with the cost of keeping it in service (the fixed costs). If the fixed costs are greater than the benefits the units are retired economically by the model, not by user input. The fact that the reserve was higher than 30% is just indicative that the reserve margin was not a binding constraint.

**Request 73**

**In Section 8.7.3 of the IRP, Siemens describes the planning reserve margin (PRM) sensitivity analysis (lower PRM) it undertook and concludes “*The LTCE resulting from this optimization had in fact higher levels of reserves reported compared to previous solutions in which the PRM target was set to 30%. This increase in reserve levels despite using lower PRM target is mainly caused by the optimization algorithm that was able to find an slightly better solution in which the PRM again is not a binding constraint and confirmed that it had minimal impact on the overall results.*” Please explain why Siemens believe this result would have occurred.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 73 Please see our prior responses on the objectives of optimization and the binding constraints.

**Request 74**

**Please provide a complete list of the retirements that were forced and those that were economically selected and when as discussed during the September 4th and 5th technical hearings.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 74 This varies by scenario, but it is simple to determine by inspection. All units were retired economically by the optimization process, with the only exception of steam units burning heavy fuel oil (MATS incompliant) that must be retired by the end of 2024, so any unit retired at the end of that year (typically Palos Seco 3 or 4) is by input.

**Request 75**

**Please confirm that RSA costs are not included in any of the workpapers provided for this IRP.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 75 The RSA was not part of the considerations of the IRP.

**Request 76**

**Was AES involved in any way or manner in the preparation of the AES Coal Plant Conversion Assessment?**

- a) Did PREPA communicate with any AES representative to prepare the Assessment? If so, provide the name and position of each AES representative.
- b) Please provide a detailed description of the discussions between PREPA and AES.
- c) Please provide all correspondence and information exchanged between PREPA and AES.

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information

and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 76 a) AES was not involved in the preparation of the study. We requested information on any prior studies that AES could have, but none was provided.

Request 76 b) See above.

Request 76 c) See above.

**Request 77**

**Please refer to Law 17-2019, Section 3(H): “*Every integrated resource plan shall include ... PREPA and electric service companies’ environmental assessments related to air emissions and water consumption, solid waste, and other factors such as climate change.*”**

- a) Is AES and electric service company as defined in this law?

The following response was provided by Efran Parede Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 77 a) Please refer to the definition of electric service company established in Act 17-2019, Article 1.2 (c).

**Request 78**

**Does AES Coal Plant Conversion Assessment take into account the cost of the proper disposal of coal ash from the AES Guayama plant? If so, please provide all supporting analysis and documentation. If not, explain why not.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 78 No. This analysis was beyond the scope of the study.

**Request 79**

**Admit that the early retirement of the AES Guayama coal plant would reduce the volume of coal ash to be ultimately disposed of, compared to retirement in 2027. If anything but an unqualified admission, please provide a detailed explanation.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 79 The early retirement of the AES Guayama coal plant would reduce the volume of coal ash to be disposed of as compared to retirement in 2027.

.

**Request 80**

**Does the Assessment take into account the cost of cleaning the site? If so, please provide all supporting analysis and documentation. If not, explain why not.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 80 No. This analysis was beyond the scope of the study.

.

**Request 81**

**Does the Assessment consider the cost of restoration of the ecosystems affected by AES operation? If so, explain how. Provide documentation. If so, please provide all supporting analysis and documentation. If not, explain why not.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 81 No. This analysis was beyond the scope of the study.

**Request 82**

**Does the AES Coal Plant Conversion Assessment take into account the social cost (i.e. health impacts, groundwater contamination) of AES operation as an economic cost for Puerto Rico and its citizens? If so, please provide all supporting analysis and documentation. If not, explain why not.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 82 No. This analysis was beyond the scope of the study.

**Request 83 Does the AES Coal Plant Conversion Assessment take into account the impacts on climate change and its economic costs? If so, please provide all supporting analysis and documentation. If not, explain why not.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consulting and Jack Henry, PE, Senior Staff Consultant, Siemens PTI. Nelson Bacalao and Jack Henry certify that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 83 No. This analysis was beyond the scope of the study.

.

**Request 84**

**For each run presented in the AES Conversion Assessment in which AES retires in 2020, did Aurora fully optimize the replacement resources? If not, in which scenarios and for which resources were they hardcoded?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 84 Subject to the limits on installation by year and the peakers for covering critical loads in the MiniGrids, the rest of the additions were selected by the model.

**Request 85**

**What is meant by the term "ESM w/AES Ret prior fix"?**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 85 It means the ESN case with AES retirement and the “prior fix” is to indicate that this case is the “raw” result from the optimization process that has problems in optimally deploying the storage in the last years of the plan (all dumped in the last year). Sometimes, we make an adjustment by redistributing this last year storage over the prior years in order to minimize curtailment. We confirm the adequacy of the adjustment by confirming a reduction in the present value of total costs.

**Request 86**

**Please explain why the NPVs in the AES Conversion Assessment do not match up with the NPVs reported in the narrative of the Assessment? Provide a workbook that reconciles the two.**

The following response was provided by Nelson Bacalao, PhD, Senior Manager Consultant, Siemens PTI. Nelson Bacalao certifies that, to the best of their information and belief, all answers provided by them herein are true and no false or misleading information has been provided.

**Response:** Request 86 We are not sure to what difference and what files this question refers to. However, the NPV & workbook correspondence is as follows:

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Table 3 2: S4S2B Base Case and with AES Retirement Costs: S4S2B\_Metrics\_(AES retired)\_SII\_r4\_Smooth.xlsx

Table 3 6: ESM Base Case and with AES Retirement Costs: ESM\_Metrics\_Base\_CEPR\_Smooth.xlsx

Table 3 10: S1S2B Base Case and with AES Retirement Costs: S1S2B\_Metrics\_Base\_CEPR\_Smooth.xlsx

Table 3 14: S3S2B Base Case and with AES Retirement Costs: S3S2B\_Metrics\_Base\_CEPR\_Smooth.xlsx

Table 3 18: S5S1B Base Case and with AES Retirement Costs

S5S1B\_Metrics\_Base\_CEPR\_CCGT\_smooth\_v2.xlsx

**Request 87**

**Does AES provide 454 or 417 MW of peak capacity?**

The following response was provided by Efran Paredes Maisonet, Director of Planning and Environmental Protection, PREPA. Efran Paredes Maisonet certifies that, to the best of his information and belief, all answers provided by him herein are true and no false or misleading information has been provided.

**Response:** Request 87 AES provides 454 MW of peak capacity (2x227).

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**Informe sobre el impacto de la construcción y operación del proyecto *Montalva Solar Farm*  
en la zona de la Reserva Agrícola del Valle de Lajas**

**Sometido por petición a**

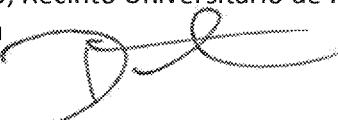
Lic. Laura Arroyo

*Staff Attorney, Earthjustice*

14 octubre 2020

**Por**

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***Agradecimientos***

Se agradece el diálogo con A. Irizarry-Rivera (Catedrático UPR-RUM) y A. Vivoni (Portavoz  
Frente Unido Pro-Defensa Valle de Lajas y A. Vivoni en la revisión del documento.

***in Memoriam***

Este trabajo está dedicado a la memoria del amigo y colega, Agrónomo Honorario Luis Conty  
Pérez, quien en vida luchó incansablemente por la preservación y el desarrollo agrícola  
sustentable del Valle de Lajas.

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## **Resumen ejecutivo**

A petición de la organización *EarthJustice*, proveo mi opinión profesional sobre el *Borrador de Declaración de Impacto Ambiental Montalva Solar Farm, Guánica-Lajas* (B-DIA) para la construcción y operación de una facilidad de producción de energía fotovoltaica en los municipios de Guánica y Lajas. En este documento (i) se resumen los antecedentes y situación actual de la energía fotovoltaica en Puerto Rico, (ii) se resume el plan de acción propuesto en el B-DIA, y (iii) se hace un análisis del proyecto desde la perspectiva agrícola-ambiental.

La Autoridad de Energía Eléctrica (AEE) tiene como meta generar la totalidad de la demanda de energía con fuentes renovables para el año 2050. Con tal fin, la AEE se ha embarcado en acuerdos de compra y operación basado en megaproyectos que impactarán terrenos de alto valor agrícola y de alto valor ecológico. Montalva Solar Farm, Guánica-Lajas es uno de esos proyectos.

El proyecto pretende construirse en un conglomerado de parcelas de 2,843 cuerdas actualmente en uso agrícola y descanso (conservación de recursos). La tenencia de tierra es privada. El uso de terreno actual es agrícola y conservación y la cubierta de tierra es de forraje para corte de heno, ganadería de carne y conservación de recursos. El 50% de los suelos en el área están clasificados como *Prime Farmland if Irrigated, Soils of Statewide Importance* y *Prime Farmland if Irrigated and Reclaimed* por USDA. Esta clasificación establece entre otros atributos, que los suelos tienen la mejor combinación de propiedades físicas y químicas para producir comida, alimento, forraje, fibra y otros cultivos de importancia económica. Cerca del 30% de los suelos tiene acceso al sistema de riego y están dotado de drenajes para facilitar la producción agrícola como parte del Proyecto del Suroeste, creado en la década del 1950. El riego y drenaje puede ser expandido a otras partes del área propuesta para la construcción. El 53% de los suelos (algunas series San Germán, Pozo Blanco, Aguilera, Aguirre, Fé, Gúanica, Fraternidad y Altamira) son considerados de alta fertilidad y con el manejo adecuado del riego y drenaje pueden ser altamente productivos. El convertir el área, de uno agrícola a uno industrial de producción de energía contribuiría a la ya existente alta tasa de pérdida de terrenos agrícolas y baja proporción de terrenos agrícolas en Puerto Rico. La construcción del proyecto establecería un precedente para que otros terrenos en reserva agrícola u otras áreas con terrenos de alto valor agrícola se utilicen para la construcción de fincas de energía solar fotovoltaica. Todo esto contribuiría a aumentar la dependencia de bienes agrícolas de importaciones de EE. UU y otros países con posiblemente menores restricciones ambientales y fitosanitarias que en Puerto Rico.

El proponente pretende combinar la generación de energía solar con la crianza de ovinos. No se provee un estudio de viabilidad económica, seguridad e integridad de animales, capacidad administrativa de manejo de ese tipo de proyecto por el proponente, especialmente considerando que el mismo se realizará entremezclado y con la presencia de módulos fotovoltaicos, transformadores, y baterías en la zona. Se ha documentado el uso de ovinos en fincas fotovoltaicas para el pastoreo del forraje entre los módulos. Pero, estos no necesariamente tienen un fin comercial para la venta de la carne y subproductos si no para talar las áreas verdes. Para sostener una producción de ovinos, eficiente y rentable, el agro-

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ecosistema tiene que ser manejado intensivamente con forraje mejorado, riego, fertilización y otros insumos, y consideraciones de manejo del animal y estudios del mercado.

Como alternativa, se recomienda que se establezca la empresa de producción de ovinos en 1,593 cuerdas del área propuesta siguiendo las recomendaciones del Servicio de Extensión Agrícola de la Universidad de Puerto Rico, Recinto Universitario de Mayagüez. Como alternativa, también, hay cultivos alternos de mayor rentabilidad económica que la producción de forraje y ganadería de carne, que se podrían establecer en la zona. Se recomienda, además, que se establezcan los paneles fotovoltaicos en los techos de estructuras residenciales e industriales en los municipios del suroeste, como, por ejemplo, Guánica, San Germán, Cabo Rojo, Lajas y Yauco, siguiendo las recomendaciones de organizaciones como Queremos Sol Puerto Rico y peritos de la Universidad de Puerto Rico, Recinto Universitario de Mayagüez. La propuesta para la generación de energía en techos está basada en estudios científicos probados y aparenta representar la mejora alternativa de uso de tierra y costo, como alternativa energética para Puerto Rico. De esta manera se estará generando la cantidad de energía propuesta para cumplir con la Política Pública Energética de Puerto Rico y preservando los terrenos agrícolas para garantizar parte de la seguridad alimentaria para esta y futuras generaciones del país.

Basado en un análisis objetivo y científico del proyecto, se rechaza la construcción y operación del proyecto para generar energía solar con módulos fotovoltaicos en terrenos agrícolas de alto valor, dentro y en áreas adyacentes a la Reserva Agrícola del Valle de Lajas.

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La Oficina de Gerencia de Permisos (OGPe) en calidad de proponente, ha presentado el Borrador de Declaración de Impacto Ambiental Montalva Solar Farm, Guánica-Lajas (B-DIA)<sup>1</sup>. El mismo fue preparado por Daniel J. Galán Kercadó Gerente Ambiental de Quantum Consulting, LLC a favor de PBJL Energy Corporation para la construcción y operación de una facilidad de producción de energía fotovoltaica con una capacidad de hasta 165 MW AC en los municipios de Guánica y Lajas. En este documento (i) se resumen los antecedentes y situación actual de la energía fotovoltaica en Puerto Rico, (ii) se resume el plan de acción propuesto en el B-DIA, y (iii) se hace un análisis del proyecto desde la perspectiva agrícola-ambiental.

**I. Antecedentes y situación actual de la energía fotovoltaica en Puerto Rico**

- Entre 2008 y 2012 la Autoridad de Energía Eléctrica (AEE) firmó 68 acuerdos de compra y operación (*PPOA por sus siglas en inglés*). Entre el 2012 y el presente muchos de los acuerdos se re-negociaron.
- Los proyectos aparentemente se originaron durante la administración gubernamental de 2009 al 2013 y son producto de un proceso expedito (“fast-track”) que no contó ni con participación ciudadana ni con una evaluación rigurosa de los impactos directos y a largo plazo para el desarrollo sostenible del país.
- El 19 de junio de 2020, la AEE sometió al Negociado de Energía de Puerto Rico (NEPR) una solicitud de enmiendas a los contratos de compraventa de energía renovable en 16 proyectos no-operacionales para una capacidad proyectada de 579 MW. Entre esos acuerdos estaba el propuesto en este B-DIA, *Montalva Solar Farm Lajas-Guánica*.
- Bajo la ley de Política Pública Energética de Puerto Rico (LPPR 17 del 11 abril de 2019)<sup>2</sup>, AEE tiene el mandato de obtener el 40% de su electricidad de recursos no renovables para el 2025, 60% para el 2040, y 100% para el 2050.<sup>3</sup>
- Para el año fiscal 2019, la energía fotovoltaica a escala comercial se generaba en 7 proyectos en operación o pre-operación para un total de 147 MW.<sup>4</sup>, o cerca del 3.9% de la capacidad de consumo de la isla. Actualmente, el proyecto más grande de energía fotovoltaica a grande escala en operación es Oriana Energy, LLC (Yarotek, LLC) en Isabela

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<sup>1</sup> Galán Kercadó, D. J. 2020. Borrador de Declaración de Impacto Ambiental. Número de caso en OGPe 2020-314865-REA-004636

<sup>2</sup> <http://www.agencias.pr.gov/ogp/Bvirtual/leyesreferencia/PDF/17-2019.pdf>.

<sup>3</sup> Autoridad de Energía Eléctrica, SB 1121 Puerto Rico Energy Public Policy Act, p. 23.. Disponible en - <https://aeepr.com/es-pr/QuienesSomos/Ley17/A-17-2019%20PS%201121%20Politica%20Publica%20Energetica.pdf>.

<sup>4</sup> Puerto Rico Electric Power Authority Integrated Resource Plan, Appendix 3 – Renewable energy project status. Disponible en <https://aeepr.com/es-pr/QuienesSomos/Ley57/Plan%20Integrado%20de%20Recursos/PREPA%20Ex.%201.03%20IRP%202019%20Appendix%203%20-%20Renewable%20Energy%20Project%20Status.pdf>.

generando 45 MW AC.<sup>5</sup> De aprobarse el Montalva Solar Farm, más que se duplicará la cantidad de energía solar que se produce actualmente.

- La AEE pretende añadir hasta 1,800 MW y 920 MW en almacenaje en baterías para el 2025.<sup>6,7</sup>

## **II. Resumen de los planteamientos más relevantes del B-DIA según propuesto**

### **1. Aspectos generales**

- a. El proyecto pretende generar 20 empleos directos o indirectos durante la operación que se espera dure 30 años. Al finalizar el proyecto, se propone desmantelar el mismo siguiendo la reglamentación vigente. (B-DIA, p. 3).
- b. El proyecto tiene una inversión de \$250,000,000 que incluye los estudios, la compra e instalación de los módulos fotovoltaicos, las medidas de control y protección de los recursos naturales existentes y la construcción de facilidades accesorias (B-DIA, p. 11).
- c. El proyecto pretende generar 165 MW AC, o el 4.46% del consumo pico energético de la isla. Actualmente, el PPOA es por 80 MW entre *PBJ Energy Corporation* y PREPA por un plazo de 25 años.
- d. El proyecto propuesto está localizado cerca de la carretera 116, barrios Costa y Montalva en los municipios de Lajas y Guánica.
- e. La energía generada en el proyecto se interconectará a la red de PREPA mediante una modificación de una línea aérea existente a través de varias fincas de la Reserva Agrícola del Valle hacia el norte conectando con San Germán a una distancia de 7.38 km.
- f. El Proyecto propuesto está ubicado en 12 parcelas privadas. El dueño de las parcelas es José A. Acosta.
- g. El proyecto propuesto tiene una cabida total de 1,799 cuerdas, de las cuales 1,267 cuerdas serán transformadas de su uso actual, el cual es agrícola, y cubiertos por 165 módulos fotovoltaicos, transformadores, baterías de almacenamiento, estructuras accesorias, caminos y subestaciones.
- h. El proyecto pretende ocupar las áreas de las fincas con elevaciones de 4 metros sobre el nivel del mar (msnm) hasta 50 msnm. Los terrenos en elevaciones mayores a 50 msnm no serán utilizados y se mantendrán es su estado actual. (B-DIA, p. 23).

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<sup>5</sup> U.S. Energy Information Administration (EIA). Puerto Rico Territory Energy Profile.  
<https://www.eia.gov/state/print.php?sid=RQ#105>

<sup>6</sup> Puerto Rico Energy Bureau, PREPA Resource Planning - An Action Plan for a Greener, More Resilient Puerto Rico (August 2019), p.22.

<sup>7</sup> U.S. Energy Information Administration (EIA). Puerto Rico Territory Energy Profile.  
<https://www.eia.gov/state/print.php?sid=RQ#105>

**2. Sobre la conversión de uso tierra de uno agrícola a uno de energía renovable.**

- a. Se propone fomentar el uso agrícola en áreas que no estén impactadas por los módulos fotovoltaicos, caminos y estructuras asociadas. Esta área se estima en 532 cuerdas. El proyecto alega que el mismo protegerá el área contra la expansión urbana (urbanizaciones, industrias, carreteras, etc.) (B-DIA, p. 7) “la cual una vez invade estas zonas las altera sin posibilidad de que se generen beneficios agrícolas”. El proyecto alega que el mismo no limitará el área para uso agrícola (B-DIA, p. 7).
- b. El proponente alega que las actividades agrícolas (sic. actuales) están limitadas a pastos y crianza de ganado, pero el drenaje es necesario debido a que la humedad del suelo limita el uso de maquinaria agrícola. Pequeñas áreas presentan suelos adecuados para el cultivo, pero la influencia de áreas de humedales adyacentes o la poca profundidad y suelos rocosos limitan el desarrollo de éstos.” (B-DIA, p. 24)
- c. El área de estudio es considerada en su mayoría como fincas de forraje para corte de heno o pastoreo para la ganadería de carne. En algunas parcelas el forraje el heno está entremezclado con árboles maduros Úcares (*Bucida buceras*), Bayahonda (*Prosopis juliflora*), Acacia (*Albizia lebbeck*), Guamá Americano (*Pithecellobium dulce*), Tamarindo (*Tamarindus indicus*), Guayacán (*Guaiacum officinale*), y la Zarcilla (*Leucaena leucocephala*) (B-DIA, p. 15-16)
- d. El proponente alega que, en el pasado, los terrenos propuestos para el proyecto fueron utilizados extensamente con propósito agrícola, principalmente el pastoreo de ganado. Actualmente continúa utilizándose con este propósito, pero a una escala mucho menor (B-DIA, p.42). La industrialización, y otros factores socioeconómicos y políticos causaron el abandono de la agricultura en gran parte del área. Varios de los problemas que afectaron la producción agrícola local incluyeron la competencia con productos extranjeros, importación descontrolada de productos que podían ser producidos localmente y el uso de terrenos altamente productivos para desarrollos urbanos (B-DIA, p. 42).
- e. El proponente alega que “El Proyecto según diseñado es totalmente compatible con las actividades agrícolas existentes y propuestas. Inclusive, facilita el acceso a la finca para dichas actividades.” (B-DIA, p. 122; p. 123). “En términos de bienestar social, el Proyecto promueve el empleo local para labores de construcción y mantenimiento y no afecta o limita temporera o permanentemente las oportunidades de trabajo existentes o proyectadas en el área agrícola. Por el contrario, al mejorar la seguridad del predio, el Proyecto previene actividades delictivas en el área y evita los vertederos clandestinos. También, al viabilizar el uso agrícola del predio, el Proyecto induce la creación de empleos agrícolas del área.” (B-DIA, p. 123)

**3. Sobre los recursos de suelos en el área propuesta**

- a. El proponente estipula que “...Muchos de los suelos son buenos para cultivar. Suelos en los llanos inundables se encuentran a lo largo de los ríos y arroyos en las llanuras costeras y en valles tierra adentro. Estos suelos generalmente tienen un buen potencial para la agricultura”. (B-DIA, p. 24)

- b. El proponente menciona que el área que ocuparía el proyecto tiene aproximadamente 54 tipos de suelo. Las series de suelos más comunes son Altamira gravelly clay (AtD) y Fraternidad clay (FrA). Estos suelos están clasificados como suelos no-hídricos, el Altamira graverly clay no está considerados como “prime farmland” y el Fraternidad clay se considera como “prime farmland: si es irrigado. (B-DIA, p. 24, p. 27-31).
- c. El proponente reconoce que cualquier impacto sobre los terrenos que sean clasificadas como *Prime Farmland* tienen que cumplir con *Farmland Protection Policy Act (FPPA) 7.U.S.4201.* (B-DIA, p. 27). La agencia que autorizaría la conversión de uso a uno no-agrícola es USDA-NRCS.

#### **4. Sobre el impacto del proyecto sobre los recursos naturales**

- a. El proponente reconoce que área es considerada por el Servicio de Pesca y Vida Silvestre de los E.U. (USFWS por sus siglas en inglés), como un Hábitat Crítico para la Mariquita de Puerto Rico, ave endémica y clasificada como en peligro de extinción. Se realizó un censo de aves donde se observaron 14 especies, pero, no se observó Mariquitas (B-DIA, p. 13, p. 17). El DRNA determinó en 2010<sup>8</sup> que el área del proyecto se encuentra fuera del hábitat crítico. (B-DIA, p. 21).
- b. Los siguientes sistemas naturales se encuentran dentro del proyecto (acuífero, hábitat crítico, humedales, lago artificial, Reserva Agrícola) y los siguientes se encuentran cerca desde el perímetro del predio (área costanera, arrecifes, bahías, bosque, canal, pozo, refugio de aves, reserva natural). Según el B-DIA, ninguno de los sistemas naturales se afectará significativamente. (B-DIA, p. 33-34; p. 34-40; p. 83-84)

#### **5. Sobre la ordenación legal de uso de terrenos y su relación con el proyecto**

- a. El proponente alega que, conforme al Reglamento Conjunto para la Evaluación y Expedición de Permisos Relacionados al Desarrollo, Uso de Terrenos y Operación de Negocios (RC 2019) con vigencia del 7 de junio de 2019, la instalación de solares fotovoltaicas es consona con los objetivos del distrito de calificación A-G, "...pues al momento presente, el predio está prácticamente en desuso agrícola y económico, por lo que ninguna actividad agrícola o económica será desplazada como parte de la acción. Tampoco se contemplan impactos ambientales significativos en el predio bajo estudio ni impactos ambientales que trasciendan los límites del Proyecto." "...se pretende que el proyecto sea evaluado por la Junta Adjudicativa en el proceso de Consulta de Ubicación y por la OGPe para la otorgación de los permisos correspondientes." (B-DIA, p. 44).
- b. El proponente alega que los terrenos fueron utilizados extensamente con propósito agrícola, que continúa usándose, pero a una escala menor. Se propone armonizar la creación de energía renovable con el potencial de uso agrícola que tiene la finca,

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<sup>8</sup> Borrador de Designación del Hábitat Natural Crítico y Hábitat Natural Crítico Esencial para la Mariquita de Puerto Rico (según mencionado en el B-DIA, p. 21).

recuperando el potencial agrícola y económico del área. La propuesta es realizar una “crianza de ganado ovino en producción ecológica. Los ovinos pastorean en los terrenos del proyecto para mantener la vegetación en niveles razonables a la vez que se benefician de tener áreas adicionales de pastoreo sin costo.” (B-DIA, p. 45; p. 71)

- c. El proponente utiliza como guía el mapa de calificación del plan territorial del Municipio de Lajas adoptado por la Junta de Planificación el 28 de junio de 2017. En dicho mapa los terrenos en la extensión municipal de Lajas al Sur de la carretera estatal #116 están clasificados como Agrícola de alta intensidad (A.a) y Conservación general (O.g). Los terrenos al Norte de la carretera estatal#116 están clasificados como Agrícola en Reserva Uno (AR-1), según el Mapa de Delimitación y Zonificación Especial para la Reserva Agrícola del Valle de Lajas adoptado por la Junta de Planificación el 19 de junio de 2014. Según el plan de uso de terrenos la zonificación de estos terrenos es suelo rústico especialmente protegido agrícola (SREP-A). (B-DIA, p. 46).
- d. El proponente reconoce que parte del proyecto está ubicado en zona inundable (B-DIA, p. 52).
- e. El proponente utiliza como base legal el Reglamento Conjunto 2019. La Tabla 6.54 del RC (2019) (p. 348-349) estipula los usos permitidos en Distrito R-G, entre ellos, proyectos de energía renovable. Según el proponente, el uso propuesto es permitido en distrito R-G. (B-DIA, p. 87). Hay 554 cuerdas del proyecto clasificado en Distrito de Calificación R-G (zona de Guánica).
- f. La Tabla 6.57 del RC (2019) (p. 358) estipula los usos permitidos en Distrito A-P, entre ellos, proyectos de energía renovable. Según el proponente, el uso propuesto es permitido en distrito A-P. (B-DIA, p. 89). Hay 639 cuerdas del proyecto clasificado en Distrito de Calificación A-P (zona de Lajas).
- g. El RC (2019) no autoriza proyectos de energía renovable en Distrito Conservación de Recursos (RC). Hay 80.5 cuerdas calificadas en RC. El B-DIA pretende proponer el mecanismo de consulta de ubicación para el proyecto.
- h. El proyecto tiene 325 cuerdas en Reserva Agrícola (B-DIA, p. 94). El proponente alega que...” Si bien es cierto que estas tres fincas están afectadas por la condición de pertenecer a la Reserva Agrícola de Lajas, también es cierto que en el distrito Agrícola Productivo se permiten los Proyectos de Energía Renovable.” RC (2019, p. 341).
- i. El proponente presenta varias alternativas de desarrollo: (I) No acción; (II) Alternativa de Desarrollo de Un Proyecto Agrícola; (III) Alternativa de Construir un Desarrollo Residencial; (IV) Alternativa de Construir el Proyecto Propuesto, siendo la IV la mejor opción (B-DIA, p. 99-108). El proponente alega que “Esta (sic. IV) alternativa representa una doble solución económica y social que aportaría al cumplimiento de la Política Pública de Diversidad Energética y al desarrollo para fines agrícolas, de agroturismo y para consumo del producto local.”

### **III. Comentarios y análisis relacionados a la acción propuesta**

Se evalúo el *Borrador de Declaración de Impacto Ambiental Montalva Solar Farm Guánica-Lajas* (B-DIA), presentado por Daniel Galán Kercadó en representación de *Quantum Consulting LLC*. Se revisaron imágenes visuales de *GoogleEarth* y espectrales de *Sentinel2A* para hacer observaciones de carácter ambiental. También, se hicieron algunas observaciones de carácter agronómico-ambiental mediante los catastrós de la Junta de Planificación (JP), recursos de suelo que incluye series y características morfológicas del perfil de las series, (NRCS), clasificación según la Junta de Planificación (2015), calificación según JP (2019), elevación LIDAR y pendiente (USGS,2015-2017), áreas prioritarias de conservación (DRNA, 2008) e hidrografía (CRIM, 2001). La evaluación contenida en esta sección está basada en el mejor juicio profesional y académico del autor principal y de los colaboradores contribuyentes.

Es menester de este servidor como catedrático en la Universidad de Puerto Rico, Recinto Universitario de Mayagüez, Colegio de Ciencias Agrícolas de la (CCA) emitir comentarios sobre este documento. Basado en el análisis realizado se plantea la hipótesis que este proyecto impactará negativamente la producción agrícola local y nacional afectando la integridad de los terrenos agrícolas y la preservación de las reservas agrícolas.

#### **1. Aspectos generales**

##### **a. Tenencia de tierra en el área propuesta**

B-DIA: *El Proyecto propuesto está ubicado en 12 parcelas privadas. El dueño de las parcelas es José A. Acosta.*

El B-DIA incorrectamente señala a un solo propietario del área. Nuestro análisis demuestra que el proyecto está ubicado en 15 parcelas privadas repartidas en 17 planos con múltiples propietarios (Figura 1; Cuadro 1) (CRIM, 2020). No sabemos si hubo algún cambio en los últimos meses que no haya sido actualizado en la base de datos del CRIM.

##### **b. Cabida del proyecto**

B-DIA. *El proyecto tiene una cabida total de 1,799 cuerdas, de las cuales 1,267 cuerdas serán transformadas de su uso actual, el cual es agrícola, y cubiertos por 165 módulos fotovoltaicos, transformadores, baterías de almacenamiento, estructuras accesorias, caminos y subestaciones.*

El B-DIA incorrectamente señala un área menor a la que realmente se impactará. Nuestro análisis, basado en las coberturas de la limitación de los predios por el CRIM, demuestra que las 17 parcelas ocupan un área total de 1,120 ha o 2,844 cuerdas (Figura 1). Nos preocupa la magnitud del área propuesta y la real que ocupa el proyecto, porque elimina un área significativa de terrenos en uso actual agrícola. Nos preocupa, además, el intento del proponente de minimizar la cabida del proyecto (2,844 cuerdas calculada por nosotros) de lo que realmente ocuparía (1,706 cuerdas reportadas por el proponente). Aparentemente, el

proponente calcula el área del proyecto basado en el área en terrenos entre 5 y 59 m sobre el nivel del mar (msnm) y no en el tamaño total de los planos.

**c. Ubicación del proyecto según la elevación**

*B-DIA. El proyecto ocupará las áreas de las fincas con elevaciones de 4 metros sobre el nivel del mar (msnm) hasta 50 (msnm). Los terrenos en elevaciones mayores a 50 M no serán utilizados y se mantendrán es su estado actual.*

Se realizó un análisis del área que ocuparía el proyecto, basado en la huella descrita en B-DIA. Nuestro análisis demuestra que se propone ubicar las placas fotovoltaicas en áreas menores a 4 m y mayores de 50 msnm (Figura 2). El 26% del área total de 2,844 celdas estaría en una altura sobre el nivel del mar de entre 0 y 4 m msnm y 14% estaría en alturas mayores de 50 msnm (Figura 3). El área total que ocuparían las áreas inhabilitadas es un 40% del área o 1,138 celdas.

**d. Evidencia de tala y remoción de material vegetativo en la zona**

En las parcelas 2, 17 y parte de la 4 (Ver Figura 1 para ubicar la zona), se ha talado un área de aproximadamente 30 ha (76 celdas) de bosque secundario. Esto se demuestra al realizar una apreciación visual histórica del área, en las imágenes satelitales de *Google Earth* y *Sentinel 2A* (Figura 4A y 4B). La tala-remoción ocurrió entre mayo y agosto de 2020. Se desconoce la razón por la cual esto se ha realizado. La eliminación de la vegetación arbórea podría impactar negativamente zonas aledañas a la zona de interés ya que los árboles estaban ubicados en parte de una zona de amortiguamiento y drenaje por donde discurren parte de las aguas de escorrentía de la zona de interés. Los árboles parecen haber sido muy frondosos con un extenso dosel, lo que evidencia el potencial de productividad que tienen los suelos a pesar de tener un mínimo manejo (o ninguno) de fertilización e irrigación.

La remoción de material vegetativo de la zona fue confirmada mediante un análisis de la imagen Sentinel 2A de NDVI (*Normalized Difference Vegetation Index*) para agosto 2020 (Figura 4B). La imagen demuestra las áreas pardas asociadas con menor vegetación. La zona donde se ha removido la vegetación contrasta con el resto de la zona que todavía mantiene una cubierta vegetal.

**2. Sobre la conversión de uso tierra de uno agrícola a uno de energía renovable.**

**a. Fomentar el uso agrícola**

*B-DIA. Se propone fomentar el uso agrícola en áreas que no estén impactadas por los módulos fotovoltaicos, caminos y estructuras asociadas. La construcción y operación del proyecto “protegerá el área contra la expansión urbana (urbanizaciones, industrias, carreteras, etc.)...”; “la cual una vez invade estas zonas las altera sin posibilidad de que se generen beneficios agrícolas”. El proyecto alega que el mismo no limitará el área para uso agrícola*

Al evaluar esta aseveración hay que preguntarse, ¿por qué el proyecto protegerá el área contra la expansión urbana? Se puede interpretar que la presencia de placas fotovoltaicas es tan nocivo o desagradable que evitaría que comunidades se asienten en áreas circundantes. En el B-DIA no se hace mención de la presencia de la comunidad Cuesta Blanca, quien se encuentra entre partes del proyecto, y como esta comunidad potencialmente se puede afectar.

*B-DIA. Las actividades agrícolas (sic. actuales) están limitadas a pastos y crianza de ganado, pero el drenaje es necesario debido a que la humedad del suelo limita el uso de maquinaria agrícola. Pequeñas áreas presentan suelos adecuados para el cultivo, pero la influencia de áreas de humedales adyacentes o la poca profundidad y suelos rocosos limitan el desarrollo de éstos”.*

El B-DIA reconoce que el proyecto ocuparía e impactaría un humedal. Nuestras observaciones en la zona lo corroboran y el análisis de foto aérea demuestra que 97.8 ha (248.9 cuerdas) de humedal estarían impactadas negativamente por el proyecto.

#### **b. Aspectos económicos de la producción agrícola**

*B-DIA. “...En el pasado, los terrenos propuestos para el proyecto fueron utilizados extensamente con propósito agrícola, principalmente el pastoreo de ganado. Actualmente continúa utilizándose con este propósito, pero a una escala mucho menor”. “La industrialización, y otros factores socioeconómicos y políticos causaron el abandono de la agricultura en gran parte del área. Varios de los problemas que afectaron la producción agrícola local incluyeron la competencia con productos extranjeros, importación descontrolada de productos que podían ser producidos localmente y el uso de terrenos altamente productivos para desarrollos urbanos”.*

Nuestro análisis demuestra que el 34% del área está en producción de forraje para heno, 40% está en pastoreo y 26% está en conservación de recursos (Figura 5), para un área efectiva en producción agrícola de 1,593 cuerdas. Se han hecho algunos estudios agrícola-económicos en la zona. Sotomayor y Pérez Alegría (2011)<sup>9</sup> realizaron un estudio de las actividades y el potencial agrícola en las zonas al este del Valle de Lajas y El Anegado (cerca de 18,000 cuerdas). Comas Pagán (2016)<sup>10</sup> realizó varias proyecciones económicas para el desarrollo del Valle de Lajas. Conty (2018) proveyó datos empíricos sobre el valor de la producción agrícola de Guánica y el Valle de Lajas. Para el 2018, la aportación económica

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<sup>9</sup> Sotomayor-Ramírez, D. and L. Pérez-Alegría. 2011. An assessment of agricultural activities in the eastern portion of the Lajas Valley Agricultural Reserve, within Lajas and Guánica municipalities. Universidad de Puerto Rico, Mayagüez, Estación Experimental Agrícola, Manuscrito sin publicar. 16 pp, con apéndices. Disponible en: [http://academic.uprm.edu/dsotomayor/Reprints\\_SummaryReports.htm](http://academic.uprm.edu/dsotomayor/Reprints_SummaryReports.htm).

<sup>10</sup> Comas Pagán. 2016. Plan de Reserva Agrícola Valle de Lajas 2016. Estado Libre Asociado de Puerto Rico, Departamento de Agricultura. 65 p. con anejos

(\$/cuerda) fue de \$478, \$480, y \$8,213 para heno, ganado de carne, y cultivos hortícolas, respectivamente (Conty, 2018). Comas (2016) realizó estimados basado en la implementación de tecnología y fertilización, aumentando la proyección a \$1,657/cuerda para la producción de heno, \$946/ccuerda para la producción de ganado de carne y \$19,200/cuerda para cultivos hortícolas (promedio de varios cultivos). El área en conservación de recursos no se considera debido a que posiblemente son suelos poco profundos, los suelos tienen exceso de sales para crear alguna limitación para la producción agrícola o existe la presencia de humedales, y el área efectiva agrícola se realiza en 1,820 cuerdas. Nuestro análisis demuestra que el valor agrícola anual en heno y ganadería en la zona es de \$872,574 y basado en las proyecciones de Comas Pagán (2016) podría alcanzar \$2,207,575 (Cuadro 2). Nuestro estimado es que actualmente hay 289 ha (734 cuerdas) con acceso directo al sistema de riego del Valle de Lajas. Si se convirtieran las 734 cuerdas en forraje y ganado que actualmente tienen riego, a la producción hortícola (productos de aproximadamente 120 días) restando esa área del área en ganadería y forraje el estimado, las proyecciones podrían alcanzar a entre \$6,549,634 y \$15,344,546 (Cuadro 2). El Plan de Desarrollo Reserva Agrícola Valle de Lajas de Comas (2016) demuestra proyecciones económicas para la Reserva Agrícola del Valle de Lajas basado en escenarios reales y proyecciones científicas para distintas empresas agrícolas tales como frutales, granos, forraje, hortalizas, farináceos, caña de azúcar, acuicultura, leche y novillas de reemplazo para vaquerías, ganado bovino, pequeños rumiantes, y otras empresas agrícolas. Dicho documento es actualmente la política pública del Departamento de Agricultura y la Oficina para el Desarrollo del Valle de Lajas. El alcance total de las proyecciones estimadas se resume según

Renglón	
Ingreso bruto agrícola	\$94.65 M
Empleos directos actuales	640
Empleos indirectos actuales	1,600
Incremento en empleos directos futuros	473
Incremento en empleos indirectos futuros	1,183

y demuestra el potencial agrícola de todo el Valle de Lajas (Comas Pagán, 2016) basado en un análisis científico económico confiable.

### **c. Proyecto de crianza de ovinos como alternativa**

*B-DIA. El proponente propone un proyecto de crianza de ovinos como una alternativa agrícola para la zona.*

El uso agrícola propuesto es la producción de ovinos. No se provee un estudio de viabilidad económica, seguridad e integridad de animales, capacidad administrativa de manejo de ese tipo de proyecto por el proponente, especialmente considerando que el mismo se realizará entremezclado y con la presencia de módulos fotovoltaicos, transformadores, y baterías en la zona. Se ha documentado el uso de ovinos en fincas fotovoltaicas para pastoreo del forraje entre los módulos. Pero, estos no necesariamente tienen un fin comercial para la venta de la carne y subproductos si no para la tala de áreas verdes. Para sostener una producción de ovinos, eficiente y rentable, el agro-ecosistema tiene que ser manejado

intensivamente con forraje mejorado, riego, fertilización y otros insumos, y consideraciones de manejo del animal y estudios del mercado.

La implementación de un proyecto de crianza de ovinos va mucho más allá que simplemente poner dichos animales en los predios con módulos fotovoltaicos. Al no presentar un estudio de viabilidad económica se entiende que el uso, que se le darán a los ovinos, será netamente para mantener los predios libres de malezas y no necesariamente para una producción de carne de cordero (entiéndase ovinos de 12 meses de edad o menos), la cual sería la que tendría viabilidad económica agropecuaria. Un ovino que se alimente de forrajes naturales de la zona no podrá llegar a un peso de sacrificio considerable o económicamente viable en el tiempo que se recomienda para obtener una calidad de carne aceptable. Para la crianza de ovinos para carne se hace necesario un manejo de forrajes mejorados los cuales no serían cien por ciento viables en áreas donde los módulos le proveen sombra a los forrajes ya que el crecimiento y calidad disminuye, además, el manejo de forrajes especializados requieren sistemas de riego, fertilización y talas periódicas para su manejo lo cual se dificultaría por la presencia de los módulos. Además, no se proveen datos de cuál será el manejo que se le darán a dichos ovinos en cuanto a resguardo y protección ya que son animales muy susceptibles al ataque por perros y a ser robados.

Los comentarios en la B-DIA que, “*Bajo este modelo ganaderos ovinos locales pastorean en los terrenos del proyecto para mantener la vegetación en niveles razonables a la vez que se benefician de tener áreas adicionales de pastoreo sin costo*”, reafirma que el interés del proyecto es mantener las áreas limpias de malezas que afecten las placas fotovoltaicas mas no un interés genuino por una producción agropecuaria. Y, aunque sea un pastoreo libre de costo para los ganaderos, no va a ser costo efectivo ya que se tienen que movilizar los animales dos veces al día (en la mañana a los predios de las placas y en la tarde de regreso a sus fincas donde tiene los ranchos para el resguardo de los animales) y, peor aún, que esa movilización sea para alimentar a sus ovejas con forrajes nativos y no forrajes mejorados.

La producción de carne de cabra y ovejas en Puerto Rico ha tendido a ser una de carácter doméstico/artesanal. Las personas que producen estos animales lo hacen sin fines comerciales y en caso que se lleve a la compra/venta, la misma no constituye el negocio principal del productor. El sector ha carecido de una organización para lograr una eficiente intensificación de la producción y mercadeo del producto. La producción del sector de pequeños rumiantes fue estimado (2013-2014) en 147,000 lb para un valor (ingreso bruto agrícola) de \$462,000. Nótese que el IBA para el ganado vacuno para la misma fecha fue estimado en \$23.1M.

La empresa de producción de pequeños rumiantes para leche y carne tiene mucho potencial para desarrollo en el Valle de Lajas. Se estima que hay cerca de 45 productores dedicando cerca de 500 cuerdas de terreno. La producción de estos en el área sin la construcción y operación de energía fotovoltaica sería una excelente alternativa para incrementar el valor de este rubro en Puerto Rico.

La industria de pequeños rumiantes contrasta con la industria de carne de res en Puerto Rico, el cual representa el 2.5% del ingreso bruto agrícola de la Isla, produciendo \$21,997,000, según datos preliminares del Departamento de Agricultura para el año 2016/17 (DAPR, 2019).

La producción local para el 2017 fue de 110,280 QQ de carne lo que representa el 8.86% del consumo total de la isla. En la zona suroeste del país hay alrededor de 510 fincas en donde se cría ganado según datos del Censo 2018. El 22% de las fincas productoras de ganado se encuentran en esta región. El mercado de carne de res de calidad ha tomado auge. Los clientes se interesan por saber el origen de los alimentos que consumen. El concepto de la finca a la mesa toma mayor notoriedad. Esto brinda la oportunidad de desarrollar y promover productos innovadores, de mayor calidad. Con la adopción de nuevas tecnologías aplicadas a la producción de forrajes y mejoramiento genético del hato la región Suroeste tiene la oportunidad de aumentar su producción, garantizando la seguridad alimentaria de Puerto Rico y mejorar la calidad de vida de los ganaderos.

Una crianza de ovinos para carne no va de la mano con un proyecto de módulos fotovoltaicos. Dicha crianza sería mucho más apropiada en terrenos libres de módulos, con siembras de forrajes mejorados y manejo intensivo de riego y manejo de nutrientes, donde la atención sea completa para la producción agropecuaria, la cual mantendría protegidos los terrenos agrícolas, el suelo, humedales, flora, fauna y donde se creen alternativas reales a favor de la seguridad alimentaria.

#### **d. Pérdida de terrenos agrícolas en Puerto Rico**

La protección y preservación de los terrenos agrícolas en Puerto Rico es de especial importancia. Puerto Rico tiene un área total de 2.271 millones de cuerdas<sup>11</sup> y un área en terreno agrícola de aproximadamente 487,775 cuerdas (192,037 ha) (USDA-NASS, 2017)<sup>12</sup>. Al comparar a Puerto Rico con países homólogos en términos de población, área o localización geográfica tales como Costa Rica, Cuba, República Dominicana y Jamaica, estos países tienen un área total que es 5.6, 11.7, 5.4, 1.2, veces la de Puerto Rico, respectivamente. El área dedicada a la agricultura en estos países es mucho mayor (x veces en paréntesis) que en Puerto Rico con Costa Rica (9.2), Cuba (33), República Dominicana (12.1), Jamaica (2.3). El porcentaje del área total dedicada a la agricultura de todos estos países es de al menos 40% mientras que en Puerto Rico tiene un 22% del área dedicado a la agricultura. Al comparar con 29 países-territorios homólogos del Caribe y Costa Rica, Puerto Rico ocupa el escalafón número sexto en área dedicada a la agricultura, pero el un-décimo en términos proporcionales del área total dedicada a la agricultura (área agrícola/área total). Este cuadro pone en precariedad la seguridad alimentaria de Puerto Rico y le resta competitividad ante otros países. En resumen, Puerto Rico tiene un área agrícola pequeña y una proporción relativamente pequeña del área total dedicada o separada para la agricultura.

Otro aspecto es la alta tasa de pérdida de área agrícola en Puerto Rico, y la pérdida gradual de competitividad económica agrícola con países homólogos en el Caribe y Centro América. El área en tierras agrícolas (área en fincas) en Puerto Rico se ha reducido

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<sup>11</sup> Basado en proyección métrica NAD1983

<sup>12</sup> USDA-NASS. 2017 Census of Agriculture. Disponible en  
[https://www.nass.usda.gov/Publications/AgCensus/2017/Full\\_Report/Census\\_by\\_State/Puerto\\_Rico/index.php](https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Census_by_State/Puerto_Rico/index.php).

gradualmente a través de los años, y en el último quinquenio evaluado ha cambiado de 584,987 cuerdas en 2012 a 487,774 cuerdas en 2017 para una pérdida de 17%, o una pérdida anual de 16,202 cuerdas.

Es preocupante el patrón de desvalorización de los terrenos agrícolas en Puerto Rico ante la importancia de generar energía eléctrica barata. El área que potencialmente ocuparían los proyectos de energía verde y su ubicación es preocupante. Estimado del 2018, demuestra que hay al menos 11 proyectos en operación o pre-operación para un total de aproximadamente 273 MW. Sotomayor-Ramírez et al. (2015)<sup>13</sup> describieron el impacto negativo de las turbinas eólicas en los terrenos de alto valor agrícola en a zona agrícola de Santa Isabel.

Actualmente, el Negociado de Energía de Puerto Rico (NEPR) está impulsando 16 proyectos de energía renovable de placas fotovoltaicas. Muchos de estos proyectos están ubicados en zonas llanas y costeras y de alto valor agrícola. Solo se puede especular sobre el área total que ocuparían estos proyectos. El área que ocupan las fincas por unidad de megavatio (MW) generado varía según la tecnología. Ong et al. (2013)<sup>14</sup> determinaron que para fincas de más de 20 MW el promedio de área ocupada en forma directa es de 7.2 acres/MW AC) y el área total de 7.9 acres/MW AC. Basado en el plan del NEPR de generar 590 MW-AC, la huella del impacto de la construcción y operación de los 16 proyectos fotovoltaicos podría llegar a 5,650 acres y muchos de estos en terrenos de alto valor agrícola.

La construcción de este proyecto propuesto y otros en planificación, podría provocar un escenario similar a lo acontecido en Puerto Rico en la década de 1990 a 2000. En ese periodo la población aumentó en un 8.2% y se construyeron más de 100,000 unidades de vivienda en zonas suburbanas aumentando la cubierta urbana en zonas agrícolas en más de un 10% (Parés-Ramos et al. 2008)<sup>15</sup>. Es preocupante que dueños de grandes extensiones de tierras agrícolas podrían convertir estas tierras a megaestructuras para genera energía solar impactando negativamente la huella agrícola en la isla y exacerbando la ya problemática alta tasa de pérdida de terrenos agrícolas en la isla.

#### **e. Importancia de la agricultura en la economía de Puerto Rico**

La agricultura tiene un rol muy importante en la economía de Puerto Rico. Por ejemplo, el Ingreso Bruto Agrícola para el 2014 fue de \$965.4 millones. La agricultura contribuye a la creación de empleos directos e indirectos en otros sectores de la economía debido al efecto multiplicador. Por otra parte, la agricultura aporta a la seguridad alimentaria de la isla al reducir

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<sup>13</sup> Sotomayor Ramírez, D., R. Rodríguez Pérez, I. Pagán Roig. 2015. Terrenos agrícolas y energía renovable: Caso de estudio Pattern Energy Inc. en Santa Isabel. 2015. Revista de Administración Pública. 45: 1-27. Volumen especial bajo el tema "La Administración Publica de la Energía: Clave para la Sostenibilidad Puertorriqueña".

<sup>14</sup> Ong, S., C. Campbell, P. Denholm, R. Margolis, G. Heath. 2013. Land-use requirements for solar power in the United States. National Renewable Energy Laboratory. U.S. Department of Energy. Technical Report 6a20-56290.

<sup>15</sup> Parés-Ramos, I. K., W. A. Gould, and T. Mitchell Aide. 2008. Agricultural abandonment, suburban growth, and forest expansion in Puerto Rico between 1991 and 2000.. *Ecology and Society* 13(2): 1.

**Sotomayor Ramírez, D.; Impacto de la construcción y operación del proyecto Montalva Solar Farm  
Narrativa del informe**

la dependencia de importaciones de alimentos. Este es un factor de gran importancia en Puerto Rico donde aproximadamente el 85% de los alimentos son importados, lo cual aumenta la vulnerabilidad ante los desafíos ambientales. Aun así, cada día vemos más proyectos de inversión que comprometen la actividad agrícola en toda la isla. Expansión urbana, construcción de hoteles, y desarrollo de turbinas eólicas y placas solares son algunos ejemplos de proyectos que han reducido a diferentes escalas las oportunidades agrícolas en Puerto Rico.

Actualmente el municipio de Lajas se encuentra rezagado en varios aspectos socioeconómicos. Por ejemplo, según los datos del Censo (2019), la tasa de participación laboral en el municipio es la más baja dentro de todos los municipios a su alrededor. El porcentaje de habitantes con grado de bachillerato o mayor también es el más bajo en su región. Esto pudiera explicar porque la mediana de ingresos del hogar se encuentra entre las más bajas dentro de todos los municipios a su alrededor. Ciertamente es un municipio que, a pesar de generar ingresos por turismo, sigue siendo desventajado en la región suroeste.

Un proyecto de energía fotovoltaica podría dar la impresión que no afecte las propiedades del suelo, relativo a otros usos de terreno. Sin embargo, desarrollar un proyecto de grande escala en la región compromete de todas formas la salud del suelo, y la flora y fauna al eliminar plantas y árboles. Además, este tipo de proyecto compromete el crecimiento económico, debido a que reduce los terrenos disponibles para desarrollo agrícola de esta y futuras generaciones, lo cual es crucial en esta región con menos acceso a oportunidades de empleos y menos ingresos.

En el 2015-2016, la agricultura aportó \$11.3M en Lajas y \$7.8M en Guánica (Conty, 2018), lo que corresponde a entre 1 a 1.5% al ingreso total agrícola del país. El ingreso bruto agrícola puede aparentar ser mínimo, pero este solamente considera el valor en la finca y no considera el efecto multiplicador del valor añadido del producto agrícola ni el de la generación de empleos. En Lajas y Guánica la agricultura puede aportar hasta un 10% del ingreso total municipal, lo que hace que estos municipios dependan principalmente de la agricultura y del turismo. Los principales cultivos en Lajas son el heno, piña y ganado de carne y en Guánica son ganado de carne y hortalizas. Garantizar el área en terrenos agrícolas en la zona de Lajas y Guánica equivale a preservar parte de la economía y el lugar de trabajo de cientos de empleos directos e indirectos.

**3. Sobre los recursos suelos en el área propuesta**

**a. Recursos de suelos en la zona**

*B-DIA. "...Muchos de los suelos son buenos para cultivar. Suelos en los llanos inundables se encuentran a lo largo de los ríos y arroyos en las llanuras costeras y en valles tierra adentro. Estos suelos generalmente tienen un buen potencial para la agricultura".*

*B-DIA. El área que ocupa el proyecto tiene aproximadamente 54 tipos de suelo. Las series de suelos más comunes son Altamira gravelly clay (AtD) y Fraternidad clay (FrA). Estos suelos están clasificados como suelos no-hydricos, el Altamira graverlly clay no*

*está considerados como “prime farmland” y el Fraternidad clay se considera como “prime farmland: si es irrigado.*

Coincidimos en que el proyecto se pretende construir en los mejores suelos agrícolas de Puerto Rico. Nuestro análisis demuestra que en la zona de interés hay 20 series de suelo, de los cuales algunos tienen más de una fase (Figura 6; Cuadro 3). El 41% del área en suelos (estimada en 999 ha o 2,538 cuerdas) pertenece a los órdenes Vertisol y Mollisol. El 47% del área en suelos pertenece al orden Aridisol y el 17 % del área pertenece a Inceptisol y Entisol.

Los Vertisoles y Molisoles son suelos son de la más alta fertilidad en cuanto a sus propiedades químicas. Los suelos poseen una alta capacidad de intercambio catiónico, pH neutral a alcalino, alto porcentaje de saturación de bases, alto contenido de materia orgánica, buena disponibilidad de nitrógeno y fósforo, textura franca a franco-arcillosa y estructura friable.

Algunos de los Vertisoles pueden tener una textura más pesada ya que posee arcillas expandibles que tienden a ser pegajosas cuando el suelo está muy húmedo y forma grietas cuando el suelo se seca<sup>16</sup>, y merecen una atención especial en cuanto a las operaciones de labranza y preparación de terreno para la siembra. Los Molisoles ocupan grandes extensiones de tierra en el sur de EE. UU para la producción de granos y a nivel mundial ocupan áreas de importancia agrícola para la producción de cultivos agronómicos como el trigo, maíz, arroz y soja. Los Molisoles tienen un horizonte superficial muy fértil (conocido como epipedón mólico) debido a la adición de materiales orgánicos de gramíneas y vegetación asociada. Los Molisoles son entre los suelos más importantes y productivos para la producción agrícola en EE. UU y a nivel mundial.

Los Aridisoles se caracterizan por un horizonte superficial (capa superior) de color claro con bajo contenido de humus, por las condiciones del suelo seco durante la mayor parte del año, y por una acumulación alta de arcillas, sales solubles o sodio. Estos suelos pueden ser muy productivos con el manejo adecuado. Evidencia de esto es que gran parte de las hortalizas que se producen en Puerto Rico, ocurre en la zona agrícola de Guánica en Aridisols (ejemplo, suelo Guayacán).

Algunos Inceptisoles y Entisoles pueden tener algunas limitaciones en cuanto a la presencia de carbonato calizo y porque tienden a ser un poco menos profundo que otros. No obstante, estos suelos pueden ser tan productivos como otros en zonas adyacentes con el manejo e implementación de tecnología adecuada.

Los terrenos donde se ubican los suelos son de la más alta fertilidad. Nuestro estimado de que un 53% son de alta fertilidad. Nuestro estimado es que cerca de 30% de los suelos o 761 cuerdas, ya tienen infraestructura de riego con acceso al canal de riego del Valle de Lajas. Otras áreas pueden ser dotados con la debida infraestructura para la captación de agua de lluvia para riego o para conectarse al sistema de riego de la Reserva Agrícola del Valle de Lajas. Los suelos llanos con pendiente moderadas con infraestructura de riego facilitan la mecanización de las actividades agrícolas. Debido al alto costo de la mano de obra, la mecanización y automatización de las actividades agrícolas son de vital importancia ahora y en

<sup>16</sup> H. Eswaran, P.F. Reich, in Encyclopedia of Soils in the Environment, 2005. Hillel, D. (editor).

el futuro. En resumen, las características geomorfológicas, infraestructura agrícola, y características físico-químicas permiten que los suelos sean altamente fértiles y la mayoría del área de muy alta productividad. Es importante que no se pierda ni una pulgada de estos suelos ya que son de alto valor.

**b. Área clasificada como *Prime Farmland***

B-DIA. "...cualquier impacto sobre los terrenos que sean clasificadas como *Prime Farmland* tienen que cumplir con *Farmland Protection Policy Act (FPPA) 7.U.S.4201*.

Nos preocupa que se reduzca el área de terrenos agrícolas identificados como *Prime Farmland*<sup>17</sup>. Según el catastro de suelos publicado por el Servicio de Conservación de Recursos Naturales (USDA-NRCS), El 50% del área en suelos están clasificados como *Prime Farmland, Farmland of Statewide Importance, o Prime Farmland if Irrigated and Reclaimed* (Figura 7). La alta fertilidad de los suelos junto con las condiciones climáticas de la zona así le permiten esa clasificación. La poca precipitación de la zona permite menor potencial de lixiviación de nutrientes, menor erosión, menor pérdida de nutrientes por escorrentía, y menor humedad relativa el cual permite mejor control de fitosanitario de patógenos. Las experiencias de este servidor y estudios realizados con colaboradores, estudiantes y agricultores demuestran que los terrenos donde se ubicará el proyecto son de alto valor agrícola y se pueden considerar como entre los mejores suelos de Puerto Rico, debido a la combinación de las propiedades físicas, químicas y biológicas (USDA, 2020)

**c. Potencial de productividad agrícola de la zona**

Se tomaron imágenes Sentinel 2A para la zona para el 15 agosto 2020. En dichas áreas se identificaron las áreas: A- Finca Bayer; B – Humedal; C - Área agrícola de alta productividad; D – Área agrícola del Anegado que tiene acumulación transitoria de agua durante eventos de tormenta; E – Area vegetal removida entre julio y agosto 2020.

En la imagen en color natural (*True Color*) (Figura 8-I), se demuestra el área de interés y la vegetación creciendo en la zona. La imagen en falso color (*False Color*) (Figura 8-II) permite observar el efecto de la vegetación actual, área en suelo desnudo (sin vegetación por arado y

<sup>17</sup> USDA. 2020. "Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil quality, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. The water supply is dependable and of adequate quality. Prime farmland is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent."

[https://www.nrcs.usda.gov/wps/portal/nrcs/detail/null/?ctid=nrcs143\\_01405](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/null/?ctid=nrcs143_01405)".

actividad agrícola), área de acumulación mayor de agua en el suelo y área donde hay remoción de vegetación reciente. La imagen de NDVI (*Normalized Difference Vegetation Index*) (Figura 8-III) demuestra las áreas verdes de mayor crecimiento vegetativo y acumulación de biomasa. En el área C y D, hay menor vegetación posiblemente por acumulación excesiva de agua en el perfil. Se observa la ausencia de vegetación en los suelos desnudos en A y en la comunidad Cuesta Blanca. En la imagen de humedad del suelo (Figura 8-IV), se observan las áreas C y D con mayor humedad en el suelo. El área E se observa con mayor humedad en el suelo posiblemente por la ausencia de vegetación (que existía) previo a junio 2020. Este breve análisis demuestra que la zona donde se pretende construir y operar el proyecto de energía fotovoltaica tiene tan alta productividad como el resto del Valle de Lajas.

#### **d. Compatibilidad entre el proyecto y actividades agrícolas**

*B-DIA. “El Proyecto según diseñado es totalmente compatible con las actividades agrícolas existentes y propuestas. Inclusive, facilita el acceso a la finca para dichas actividades.” “En términos de bienestar social, el Proyecto promueve el empleo local para labores de construcción y mantenimiento y no afecta o limita temporera o permanentemente las oportunidades de trabajo existentes o proyectadas en el área agrícola. Por el contrario, al mejorar la seguridad del predio, el Proyecto previene actividades delictivas en el área y evita los vertederos clandestinos. También, al viabilizar el uso agrícola del predio, el Proyecto induce la creación de empleos agrícolas del área.”.*

El proyecto propuesto no es compatible con la actividades actuales de producción de forraje para producir heno y para la ganadería de bovino (carne). Se realizó un análisis del área ocupado por los módulos fotovoltaicos, basado en la Finca Oriana en Aguadilla/Isabela. Dicha facilidad está dividida en dos áreas de 35 ha cada una para un total de 70 ha (Figura 9). El material vegetativo debajo de los módulos ocupa un 51% del área, por lo que dicha área reduciendo la actividad fotosintética de las gramíneas y otra vegetación arbustiva creciendo, limitando grandemente la producción vegetal. Observaciones visuales hechas por este servidor en fincas solares así también lo demuestran. El restante del 49% del área, aquella franja entre los módulos solares, posiblemente tenga algunas reducciones en duración diaria de radiación solar. Nuestro estimado es que la franja vegetativa tiene un ancho de 10 pies, lo cual podría sostener algún tipo de actividad agrícola pecuaria de muy baja intensidad. Esto, porque no se contempla la aplicación de insumos externos (riego y fertilización) para incrementar la producción vegetal (rendimiento) por lo que la productividad animal se espera que sea relativamente baja.

#### **4. Sobre el potencial impacto en los recursos naturales**

Al momento, parece haber escasa información científica para evaluar todos los impactos que pueden tener la construcción, operación, expansión de infraestructura de transmisión y decomisión de las instalaciones centralizadas a grande escala (*utility-scale solar energy, USSE*) como la propuesta en la Finca Montalva, sobre los recursos naturales y los terrenos agrícolas

(Cook et al. 2013<sup>18</sup>; Turney y Fthenakis, 2011<sup>19</sup>; Hernandez et al. 2013<sup>20</sup>). Esto incluye el potencial para la compactación y erosión durante la construcción, efecto sobre la población y diversidad de vida silvestre, modificación de los procesos hidrológicos del suelo (Figura 11). No obstante, la información existente sugiere que las fincas solares pueden tener un impacto negativo sobre el exceso de escorrentía, las tasas de erosión y sedimentación en cuerpos receptores. Los paneles fotovoltaicos son impermeables, la precipitación que cae sobre su superficie viaja hacia el extremo inferior del panel y cae libremente sobre la superficie del suelo. Cada panel produce una escorrentía en magnitud igual a la precipitación recibida; siendo descargada en su extremo de menor elevación como un flujo concentrado. Esta acción convierte los eventos de precipitación, especialmente los de mayor magnitud, en unos de alta intensidad con alto poder erosivo sobre el suelo. La lluvia que antes del panel se distribuía en un área permeable igual a la superficie del panel, ahora caería sobre una superficie impermeable y luego al suelo de manera concentrada a lo largo del extremo de menor elevación sobre el terreno, convirtiendo un evento de menor impacto en uno de hasta más de 1,000 veces más intenso (L. Pérez-Alegría, comunicación personal)<sup>21</sup>. Como es de esperarse, la impermeabilización aparente del terreno, no solo cambia el patrón de movimiento de la escorrentía superficial sino que: i) puede producir un aumento de hasta 73% del flujo máximo de escorrentía dependiendo de la cobertura del terreno debajo del panel, ii) reducir el tiempo de concentración y iii) aumentar en 10 veces o más la energía cinética de la escorrentía aumentando el poder de erosión y socavación del suelo (Cook y McCuen, 2013)<sup>22</sup>. Por tales razones, un proyecto de tal magnitud como el propuesto en la Reserva Agrícola va a aumentar el potencial de exportación de sedimentos y como consecuencia, aumentar la entrada de nutrientes en las aguas receptoras de la costa sur oeste de Puerto Rico.

Según Hernández et al. (2013) los USSE pueden fragmentar el hábitat de vida silvestre y servir de barrera migratoria. En áreas de escases de agua, los proyectos de USSE como el propuesto pueden tener conflicto con los usuarios para uso doméstico y agrícola en áreas con precipitación limitada, como ocurre en la zona Lajas-Guánica. En el Valle de Lajas, el agua para consumo humano y agrícola se originan del agua que se mueve del este al oeste a través del canal de riego al norte del Valle de Lajas. Según Hernandez y otros, estos riesgos no pueden ser minimizados y estos sugieren la instalación de USSE en tierras ya degradadas. Existe la necesidad de encontrar sitios alternos de forma tal que se minimicen los impactos sobre la producción agrícola y sus terrenos.

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<sup>18</sup> Cook, L.M., R.H. McCuen. Hydrologic response of solar farms. *J. Hydrol. Eng.* 2013.18:536-541.

<sup>19</sup> Turney, D., V. Fthenakis. 2011. Environmental impacts from the installation and operation of large-scale solar power plants. *Renewable and Sustainable Energy Reviews*. 15: 3261-3270.

<sup>20</sup> Hernandez, R.R. et al. 2013. Environmental impacts of utility-scale solar energy. *Renewable and Sustainable Energy Reviews*. 29: 766-779.

<sup>21</sup> Usando solo un panel PV de 250 watts de 61.3inx41.2in. El modulo de 1MW producirá energía erosive aún mayor.

<sup>22</sup> Cook L.M. and R.H. McCuen, 2013. Hydrologic response of solar farms. *J. Hydrol. Eng.*, 18:536-541.

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Hernandez et al. (2015)<sup>23</sup> evaluaron el impacto de proyectos de energía solar sobre los cambios en la cubierta de tierra y áreas protegidas. En el estado de California solamente el 15% de las instalaciones estaban localizadas en áreas “combatibles” o adecuadas, según criterios ambientales y agrícolas. Coincidieron Hernandez y otros que la ubicación de instalaciones USSE en áreas ya impactadas por actividad humana (o suelos degradados y de menor productividad agrícola), reduce la oportunidad de que ocurran impactos ambientales adversos y a la vez que se puedan cumplir las metas de producción de comida para futuras generaciones.

Dahlin et al. (2011)<sup>24</sup> sugieren que la demanda energética de EE. UU se puede satisfacer sacrificando el 11% del área total en cultivos (o  $101.4 \times 10^6$  ha). Esto es equivalente al área del estado de California. Una propuesta como esta no tiene sentido ya que el área agrícola en EE. UU se está reduciendo aproximadamente 2% por año y existe la necesidad de duplicar la producción de bienes agrícolas en al menos 40% para el año 2050.

Ifft et al. (2018)<sup>25</sup> describieron como los desarrolladores de las facilidades en el estado de Nueva York tienen distintas perspectivas en cuanto a la localización para las fincas solares. Los sitios más atractivos para la instalación de los megaproyectos son en fincas agrícolas, atraídos por la calidad de los terrenos, y al envejecimiento de los agricultores, balance de ingresos-deudas de los dueños de fincas (*landowners*), y la promesa de grandes ganancias de dinero para los tenedores de los terrenos al cederlos para la actividad. En ese estado se ha reconocido la participación y envolvimiento de la ciudadanía en el proceso de toma de decisiones como uno de los factores más importantes para poder hacer evaluaciones responsables del impacto de los megaproyectos.

Los estados de EE. UU. tienen diferentes políticas en cuanto a la localización de fincas solares y su impacto en terrenos agrícolas. Por ejemplo, California tiene como política favorecer el desarrollo de energía solar en terrenos que no son hábitat valioso de vida silvestre, áreas abiertas o agrícolas (Ifft et al. 2018). Solamente terreno agrícola del más bajo valor (*non-prime agricultural land*) puede ser convertido a desarrollo solar y con impuestos adicionales. En Carolina del Norte se reconoce que la transición de uso de tierra agrícola producción solar es muy atractivo para el propietario debido a que los pagos por los contratistas son mayores que el ingreso agrícola (NC-State Cooperative Extension)<sup>26</sup>. Uno de los aspectos a considerar es como la incentivos y créditos de impuestos, y tecnología cambian con el tiempo resultando en tecnología obsoleta que acaba siendo abandonada en poco tiempo. Esto presenta un dilema muy interesante para Montalva Solar Farm. ¿Qué pasaría si por alguna razón la finca solar se abandona en pocos años? ¿Puede la finca solar ser decomisada a un bajo costo, quién lo pagará

<sup>23</sup> Hernandez, R.R. y otros. 2015. Solar energy development impacts on land cover change and protected areas. PNAS. 112 (44) 13579-13584

<sup>24</sup> Dahlin et al. 2011 , citado por Hernandez et al. 2013.

<sup>25</sup> Ifft, J. T. Grout, D. Kay, D. Budgen, F.Kay, D. Lane, C. Rondem, R. Stedman, J. Sward, M. Zhang. 2018. Large-scale solar information and research needs for New York State. Community and Regional Development Institute, Cornell University. Cardi Reports/Issue 18/Mayo 2018.

<sup>26</sup> NC-State Cooperative Extension. Considerations for transferring agricultural land to solar panel energy production. Disponible en: <https://craven.ces.ncsu.edu/considerations-for-transferring-agricultural-land-to-solar-panel-energy-production/>.

y podrá revertirse a su estado original? El estado de Massachussets prohíbe la instalación de fincas solares en localizaciones que resulta en una pérdida significativa de terrenos de valor agrícola o recursos naturales, prefiriendo la instalación en techos de estructuras (MEOEEA, 2014)<sup>27</sup>.

Parte de uno o varias de las fincas agrícolas están en una zona clasificado como humedal. La conversión de humedal a agrícola ocurrió posiblemente muchos años atrás cuando esto se permitía, pero la tierra agrícola actualmente está protegida como “prior converted wetland” (PCW). Con la instalación de la finca solar, se estaría convirtiendo tierra agrícola PCW a un uso industrial. Tampoco queda claro como se manejará aspectos tales como uso de tierras en PCW, debido al abandono temprano de la finca solar o al final de su vida útil.

## **5. Sobre la ordenación legal de uso de terrenos y su relación con el proyecto**

El proponente utiliza como guía el mapa de calificación del plan territorial del Municipio de Lajas adoptado por la Junta de Planificación el 28 de junio de 2017 y el Reglamento Conjunto de 2019 (RC, 2019)<sup>28</sup>. El uso de RC 2019 es cuestionable, pero es menester de los peritos en asuntos legales dilucidar la legalidad de dicho documento.

En el RC2019 (Tomo VI, Capítulo 6.1) se establecen y definen las diferentes tipologías de calificación de suelos para establecer usos y distritos de calificación uniformes (RC, 2019). En el RC 2019 (Equivalencias Distritos de Calificación) se modificaron todas las calificaciones relacionadas y relevantes a la agricultura que existían en el RC 2010<sup>29</sup>. Por ejemplo, la calificación Agrícola General Dos, Agrícola General Tres y Agrícola General Cuatro (A-2, A-3, A-4, respectivamente) y Agrícola en Reserva Dos (AR-2) se convierten en Rural General (R-G). La calificación Agrícola Productivo (A-1) y Agrícola en Reserva Uno (AR-1) se convierten en Agrícola Productivo (A-P). Además, las calificaciones agrícolas se unificaron con otras que no guardan relación con la agricultura (como por ejemplo Terrenos Urbanizables, U-R) con la calificación A-P. La agrupación de calificaciones específicas, en donde previamente se han reconocido sus características particulares y su respectivo valor intrínseco, dentro de calificaciones más amplias, desvaloriza aquellas calificaciones que son importantes para distinguirlas y podría permitir usos que ahora no son permitidos. En dicho documento no hay criterios o justificación científica que sirva para justificar los mencionados cambios.

Las Reservas Agrícolas han sido creadas mediante legislación, comenzando con la creación de la Reserva Agrícola del Valle de Lajas (Ley 277 del 20 de agosto 1999). Estas Reservas responden a una política especial y de cuidado por parte del estado, por el valor

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<sup>27</sup> MEOEEA. 2014. Model zoning for the regulation of solar energy systems. Disponible en: <https://www.mass.gov/files/documents/2016/08/nc/model-solar-zoning.pdf>.

<sup>28</sup> Reglamento Conjunto para la Evaluación y Expedición de Permisos relacionados al Desarrollo, Usos de Terrenos y Operación de Negocios” o como el “Reglamento Conjunto 2019”. Disponible en: <https://jp.pr.gov/Reglamentos/Reglamento-Conjunto-2019>.

<sup>29</sup> *Reglamento Conjunto de Permisos para Obras de Construcción y Usos de Terrenos* (Reglamento Conjunto 2010).

especial agropecuario y para la seguridad alimenticia que representa esta zona y para el disfrute para la presente y futuras generaciones. Se entiende que el RC (2019) no puede ir por encima de la Ley 277, la cual establece que los terrenos dentro de la Reserva Agrícola del Valle de Lajas son para uso exclusivo agrícola.

Otro aspecto de importancia en el RC 2019 es que La Junta Adjudicativa podrá autorizar los usos no atendidos ministerialmente vía consultas de ubicación en Reservas Agrícolas, Naturales o Áreas de Planificación Especial. Entre los criterios a considerarse en Reservas Agrícolas, Naturales, Plan Sectorial o Áreas de Planificación Especial, se establece que la parte interesada debe demostrar que tiene la capacidad de operar el uso juiciosamente y que la operación del uso resulta conveniente y adecuada al interés público, a base de varios criterios (once de ellos), entre los cuales, el #2 establece que “No se afecta la integridad ecológica de la Reserva Agrícola, Natural o del Área de Planificación Especial, y que no ocasione peligro a los recursos naturales, históricos, culturales y agrícolas existentes.” Esta aseveración es demasiado liberal y no les da suficiente protección a los terrenos agrícolas de Puerto Rico para evitar que sean convertidos a usos urbanos u otros de carácter no-agrícola.

#### **IV. Recomendaciones y conclusiones**

Existe un plan de desarrollo agrícola para la Reserva Agrícola del Valle de Lajas, donde se proveen proyecciones económicas en al menos once empresas agrícolas (Comas-Pagán, 2016). El estudio provee análisis científico detallado que incluye planes de acción y estrategias para ser implementados. Se sugiere que se visite dicho plan como alternativa para las actividades agrícolas que actualmente se están realizando. Basado en la opinión profesional de este servidor, se recomienda que se establezca la empresa de producción de ovinos en 1,593 cuerdas de la finca siguiendo las recomendaciones del Servicio de Extensión Agrícola de la Universidad de Puerto Rico, Recinto Universitario de Mayagüez. Como alternativa, también, hay cultivos alternos de mayor rentabilidad económica que la producción de forraje y ganadería de carne, que se podrían establecer en la zona.

La necesidad de aumentar la proporción del consumo energético de Puerto Rico con fuentes de energía renovable para reducir la dependencia de combustibles fósiles, reduciendo así el impacto ambiental, contribuyentes al cambio climático, y reducir el costo de energía está ya estipulado y aceptado por la comunidad científica, académica y hasta el público en general. La generación de energía fotovoltaica es una alternativa viable. Hay varios estudios que demuestran la viabilidad de la instalación de placas solares en techos de estructuras ya existentes y micro-redes comunitarias y que su beneficio económico y ambiental es mayor que el de la instalación en grandes extensiones de terreno (Irizarry-Rivera et al. 2009<sup>30</sup>; O'Neill-

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<sup>30</sup> A.A. Irizarry Rivera, J.A. Colucci Ríos, E. O'neill Carillo, "Achievable Renewable Energy Target's For Puerto Rico's Renewable Energy Portfolio Standard, Final Report to the Puerto Rico's Energy Affairs Administration, November, 2009 (contract number 2008-132009).

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Carrillo et al. 2017<sup>31</sup>; O'Neill-Carrillo e Irizarry-Rivera, 2019<sup>32</sup>; Aponte et al. 2017<sup>33</sup>; Queremos Sol, 2019<sup>34</sup>; Irizarry-Rivera-Agustín, 2019<sup>35</sup>) como la propuesta en *Montalva Solar Farm*. Testimonios de experto, estudios, y análisis publicados por académicos y científicos de la Universidad de Puerto Rico y la participación de grupos comunitarios, así lo demuestran (ver citaciones). La inversión de \$250 M se podría utilizar para lograr que la energía para ser generada se haga en techos de estructuras en la zona suroeste de Puerto Rico, e incentivar la actividad económica orientada a los pequeños rumiantes y ganadería de carne de res en el suroeste de Puerto Rico

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<sup>31</sup> O'Neill-Carrillo, E. A. Irizarry-Rivera, I. Jordán, R. Cintrón. 2017. The long road to community microgrids. IEEE Electrification Magazine. Dec. 2018. P. 6-17.

<sup>32</sup> O'Neill-Carrillo, E. y A. Irizarry-Rivera. 2019. How to Harden Puerto Rico's grids against hurricanes. 42: Specctrum IEEE.org. 7 p.

<sup>33</sup> Aponte, E.E., E. O'Neill-Carrillo, E.I. Ortíz-Rivera, M. Castro-Sitiriche, L. Orama-Exclusa, A. Ramírez-Orquín, A. Irizarry-Rivera. 2019. Letter to Hon. Judge Laura Taylor Swain, on behalf of University of Puerto Rico Professors regarding the vision for a sustainable energy future for Puerto Rico.

<sup>34</sup> Queremos Sol. 2019. Sostenible, local, limpio. Ver. 3. Queremossolpr.com Disponible en: <https://www.queremossolpr.com/>.

<sup>35</sup> Irizarry-Rivera, A. 2019. Expert Report of Agustín Irizarry-Rivera Pursuant; PROMESA Title III - No. 17 BK 3283-LTS and PROMESA Title III - No. 17 BK 4780-LTS. United States District Court for the District of Puerto Rico. 24 p.

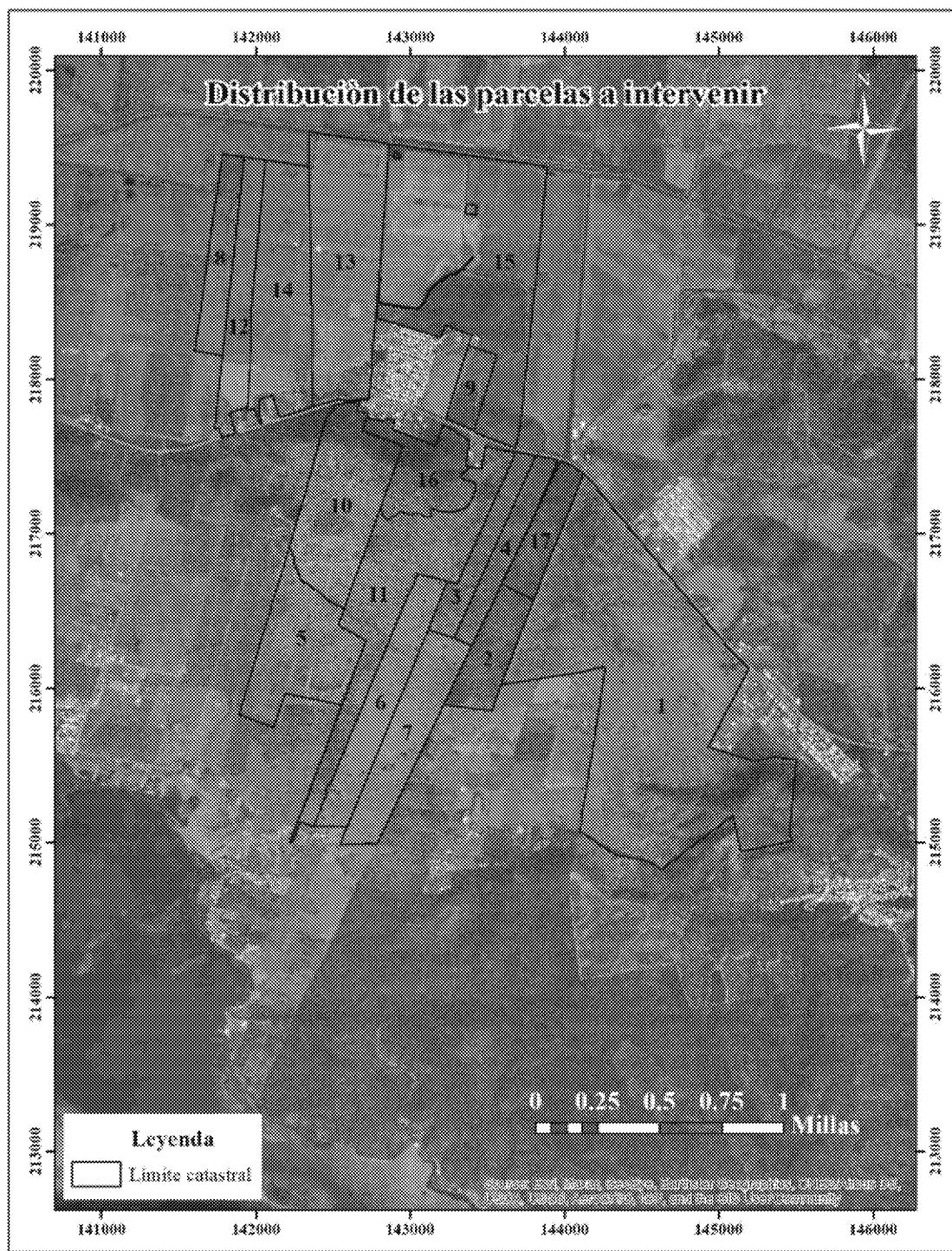
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## Figuras y cuadros

Figura 1. Parcelas identificadas en el área de construcción.



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**Cuadro 1. Detalles de las parcelas que componen el área en construcción (ver Figura 1) (CRIM, 2020). Nótese pueden haber varios catastros asociados a la misma parcela.**

Parcela	Detalles	
Parcela 1	Catastro: 428-000-004-01-027 Parcela: 428-000-004-01 Procedencia: 428-000-004-01 Dueño: RODRIGUEZ VARGAS ALFREDO Dirección física: SECTOR MAGUEYES, GUANICA Cabida escritura: 0.00 m <sup>2</sup> Área de mapa: 3,493,554.71 m <sup>2</sup>	Catastro: 428-000-004-01-901 Parcela: 428-000-004-01 Procedencia: 428-000-004-01 Dueño: RAMIREZ ACOSTA JOSE B Dirección física: BO MONTALVA CARR 116, GUANICA Cabida escritura: 3,215,845.10 m <sup>2</sup> Área de mapa: 3,493,554.71 m <sup>2</sup>
Parcela 2	Catastro: 406-000-008-03-000 Parcela: 406-000-008-03 Procedencia: 406-000-008-03 Dueño: SOTO ALMODOVAR INES Dirección física: E11 CARR 325 URB VALLE TANIA, GUANICA Cabida escritura: 234,251.24 m <sup>2</sup> Área de mapa: 241,833.46 m <sup>2</sup>	
Parcela 3	Catastro: 406-000-003-05-000 Parcela: 406-000-003-05 Procedencia: 406-000-003-05 Dueño: RAMIREZ TIO LAURA DEL ROSARIO Dirección física: KM.HM 4.3 CARR 324 BO COSTA, LAJAS Cabida escritura: 195,851.33 m <sup>2</sup> Área de mapa: 200,259.66 m <sup>2</sup>	
Parcela 4	Catastro: 406-000-003-35-000 Parcela: 406-000-003-35 Procedencia: 406-000-003-35 Dueño: RAMIREZ TIO FERNANDO Dirección física: KM.HM 4.3 CARR 324 BO COSTA, LAJAS Cabida escritura: 175,688.43 m <sup>2</sup> Área de mapa: 204,637.61 m <sup>2</sup>	
Parcela 5	Catastro: 406-000-007-25-000 Parcela: 406-000-007-25 Procedencia: 406-000-007-25 Dueño: RAMIREZ TIO LAURA DEL ROSARIO Dirección física: KM.HM 9.0 CARR .116 BO COSTA, LAJAS Cabida escritura: 925,017.29 m <sup>2</sup> Área de mapa: 517,259.44 m <sup>2</sup>	
Parcela 6	Catastro: 406-000-008-22-000 Parcela: 406-000-008-22 Procedencia: 406-000-008-22 Dueño: RAMIREZ ACOSTA JOSE B Dirección física: KM.HM 7.4 CARR 324 BO COSTAS, LAJAS Cabida escritura: 359,709.29 m <sup>2</sup> Área de mapa: 390,708.10 m <sup>2</sup>	

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Parcela	Detalles
Parcela 7	Catastro: 406-000-008-23-000 Parcela: 406-000-008-23 Procedencia: 406-000-008-23 Dueño: RAMIREZ TIO ALBERTO Dirección física: KM.HM 7.4 SEC LOS HORNOS BO COSTAS, LAJAS Cabida escritura: 383,330.94 m <sup>2</sup> Área de mapa: 427,184.13 m <sup>2</sup>
Parcela 8	Catastro: 406-000-002-02-000 Parcela: 406-000-002-02 Procedencia: 406-000-002-02 Dueño: TORRES VDA PIETRI ISIDRA Dirección física: KM.HM 9.0 CARR .116 BO COSTA, LAJAS Cabida escritura: 54.00 m <sup>2</sup> Área de mapa: 232,942.34 m <sup>2</sup>
Parcela 9	Catastro: 406-000-003-41-000 Parcela: 406-000-003-41 Procedencia: 406-000-003-39 Dueño: RAMOS CRUZ CARLOS Dirección física: KM.HM 14.4 CARR 116 BO COSTAS, LAJAS Cabida escritura: 98,259.75 m <sup>2</sup> Área de mapa: 109,341.63 m <sup>2</sup>
Parcela 10	Catastro: 406-000-002-07-002 Parcela: 406-000-002-07 Procedencia: 406-000-002-07 Dueño: RODRIGUEZ SANABRIA LUIS ANGEL Dirección física: KM.HM 14 CAMNO LA CEIBA BO SABANA YEGUAS, LAJAS Cabida escritura: 0.00 m <sup>2</sup> Área de mapa: 611,705.11 m <sup>2</sup>
Parcelas 11, 15 y 16	Catastro: 406-000-003-42-000 Parcela: 406-000-003-42 Procedencia: 406-000-003-39 Dueño: RAMIREZ ACOSTA JOSE B Dirección física: KM.HM 14.4 CARR 116 BO COSTAS, LAJAS Cabida escritura: 2,045,650.08 m <sup>2</sup> Área de mapa: 2,534,223.76 m <sup>2</sup>
Parcela 12	Catastro: 406-000-002-04-000 Parcela: 406-000-002-04 Procedencia: 406-000-002-04 Dueño: RAMIREZ TIO LAURA DEL ROSARIO Dirección física: BO COSTAS, LAJAS Cabida escritura: 490,394.76 m <sup>2</sup> Área de mapa: 306,410.49 m <sup>2</sup>
Parcela 13	Catastro: 406-000-002-07-001 Catastro: 406-000-002-07-001 Parcela: 406-000-002-07 Procedencia: 406-000-002-07 Dueño: SUCN JUAN JOSE ORTIZ SANTANA Dirección física: KM.HM 14 SEC CUESTA BLANCA BO COSTAS, LAJAS Cabida escritura: 687,661.03 m <sup>2</sup> Área de mapa: 611,705.11 m <sup>2</sup>

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Parcela	Detalles
	Parcela: 406-000-002-07 Procedencia: 406-000-002-07 Dueño: SUCN JUAN JOSE ORTIZ SANTANA Dirección física: KM.HM 14 SEC CUESTA BLANCA BO COSTAS, LAJAS Cabida escritura: 687,661.03 m <sup>2</sup> Área de mapa: 845,307.41 m <sup>2</sup>
Parcela 14	Catastro: 406-000-002-25-001 Parcela: 406-000-002-25 Procedencia: 406-000-002-05 Dueño: RAMIREZ TIO LAURA DEL ROSARIO Dirección física: REM CARR.116 KM13.3 BO COSTAS, LAJAS Cabida escritura: 817,049.47 m <sup>2</sup> Área de mapa: 869,126.96 m <sup>2</sup>
Parcela 17	Catastro: 406-000-003-07-901 Parcela: 406-000-003-07 Procedencia: 406-000-003-07 Dueño: RAMIREZ ACOSTA JOSE B Dirección física: KM.HM 9.0 CARR .116 BO COSTA, LAJAS Cabida escritura: 727,122.15 m <sup>2</sup> Área de mapa: 211,727.57 m <sup>2</sup>
	Parcela: 406-000-002-07 Procedencia: 406-000-002-07 Dueño: RODRIGUEZ SANABRIA LUIS ANGEL Dirección física: KM.HM 14 CAMNO LA CEIBA BO SABANA YEGUAS, LAJAS Cabida escritura: 0.00 m <sup>2</sup> Área de mapa: 845,307.41 m <sup>2</sup>
	Catastro: 406-000-003-07-000 Parcela: 406-000-003-07 Procedencia: 406-000-003-07 Dueño: RAMIREZ SOTO ZORAIDA Dirección física: E11 CARR 325 URB VALLE TANIA, GUANICA Cabida escritura: 175,295.39 m <sup>2</sup> Área de mapa: 211,727.57 m <sup>2</sup>

**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 2. Identificación de áreas < 4m, entre 4 y 50 m y > 50m.

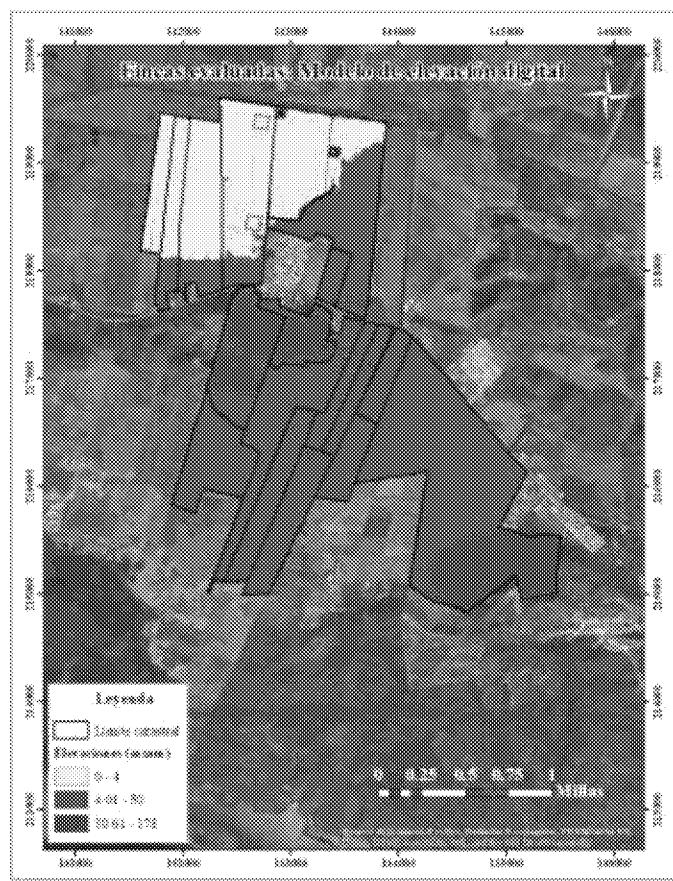
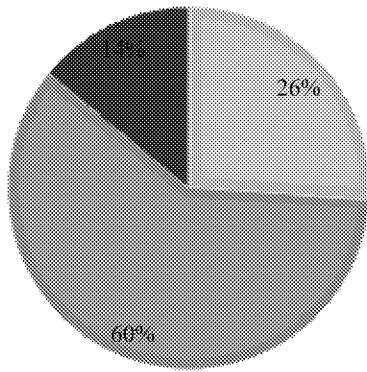


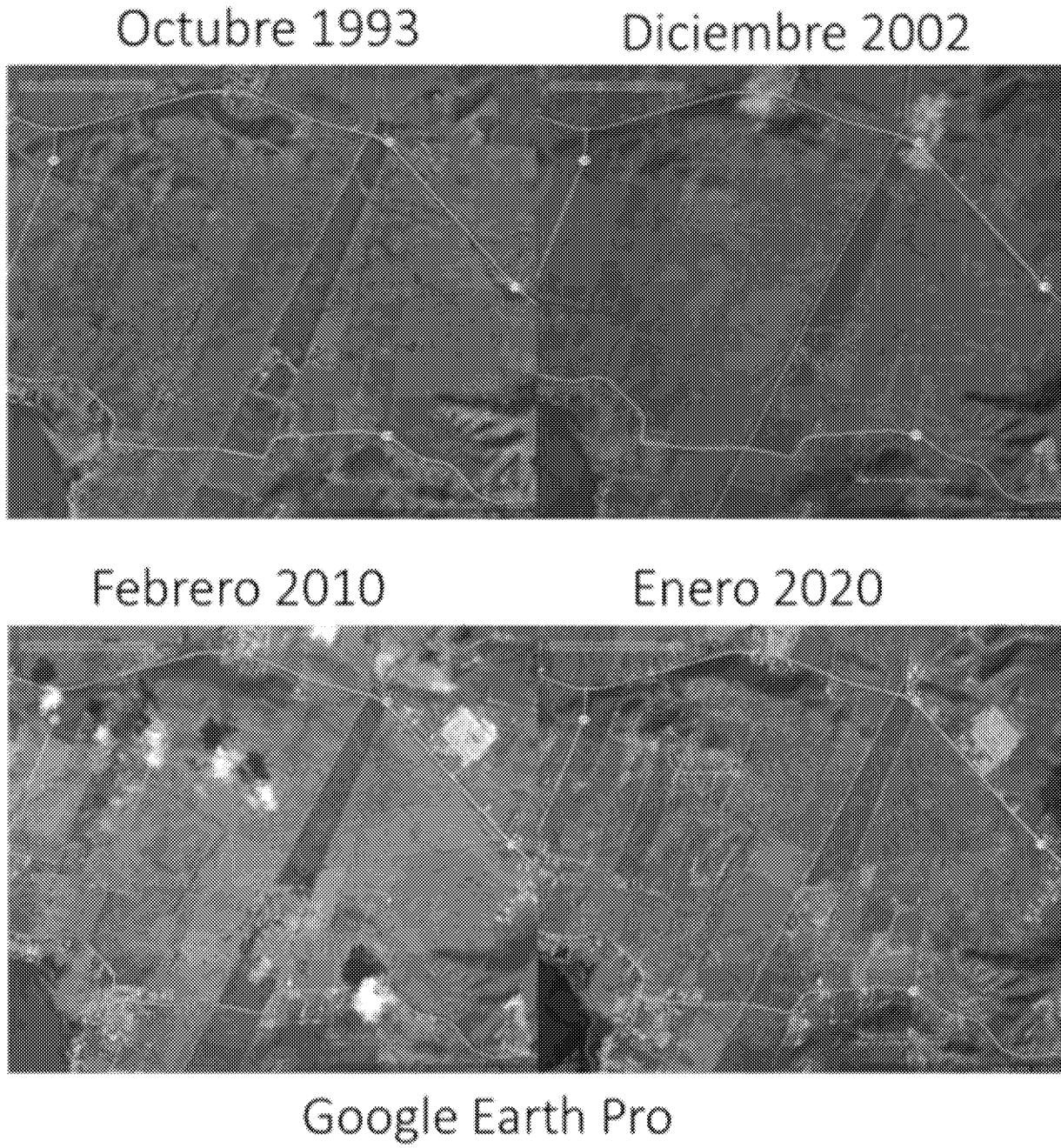
Figura 3. Distribución del área en la finca según tres clasificaciones de altura

■ Entre 0 - 4 msnm ■ Entre 4.01 - 50 msnm ■ Entre 50.01 y 178 msnm



**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 4A. Imágenes satelitales entre 1993 y 2020 evidenciando la vegetación en la zona en el recuadro (parcelas, 2, 4 y 17; ver Figura 1).



**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 4B. Imágenes satelitales Sentinel2A en enero 2020 (antes de la remoción vegetativa) y agosto 2020 (posterior de la remoción vegetativa) en las parcelas 2, 4 y 17; ver Figura 1. Evidencia la remoción de vegetación en la zona está en color pardo en contraste con el color rojo de la vegetación.

18 enero 2020

20 Agosto 2020



**Sentinel 2A (Imagen en falso color)**

**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Cuadro 2. Resumen de las proyecciones económicas anuales para las empresas agrícolas en la zona.

	Conty 1 Valor \$/cuerda)	Comas 2 Valor \$/cuerda)	Conty 3 Valor	Comas 3 Valor	Conty 4 Valor \$-----	Comas 4 Valor \$-----
<b>Cultivo</b>						
Forraje (heno)	\$478	\$1,657	\$326,557	\$1,130,938	\$150,963	\$522,819
Cultivos	\$8,214	\$19,200			\$6,028,814	\$14,092,800
Ganado	\$480	\$946	\$546,017	\$1,076,109	\$369,857	\$728,927
Total			\$872,574	\$2,207,048	\$6,549,635	\$15,344,547

1 – Basado en datos empíricos de Conty (2018)

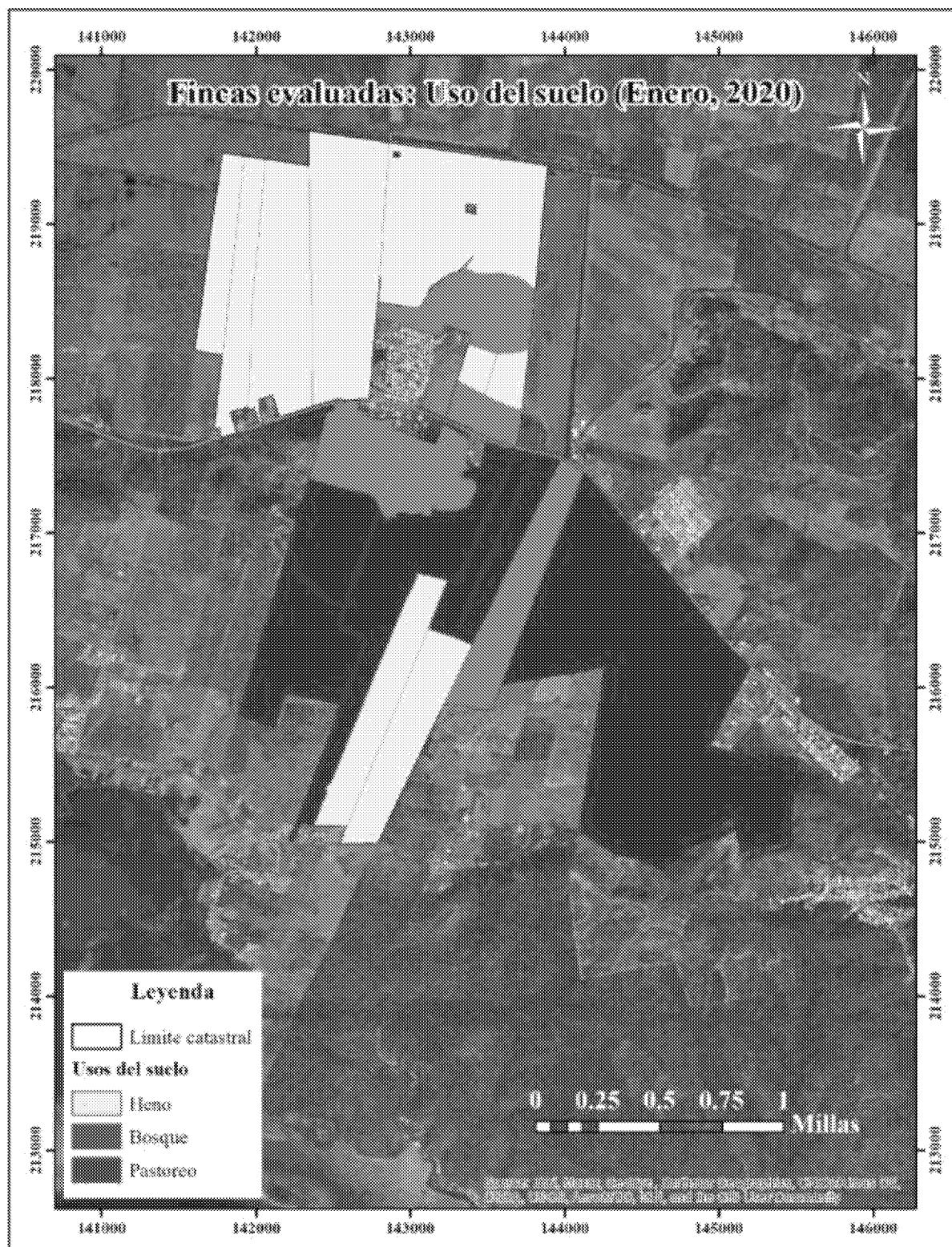
2 – Basado en proyecciones económicas de Comas-Pagán (2016)

3 – Basado en el área que ocupa cada empresa

4 – Considerando que el 50% del área en forraje y ganado vacuno se convierta a cultivo de alto valor.

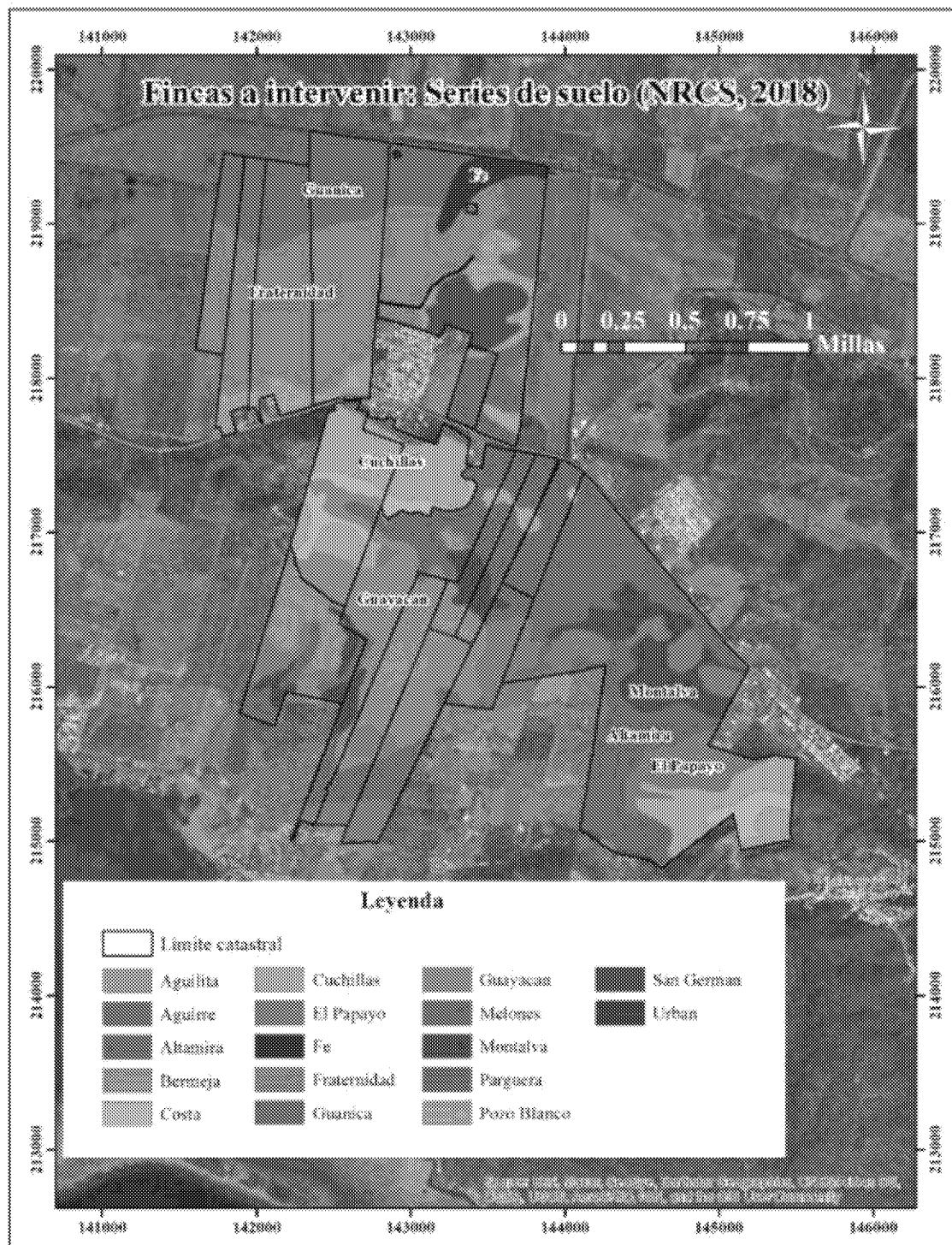
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 5. Ubicación de empresas agrícolas en la zona de construcción.



**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 6. Series de suelos en el área de construcción propuesta.



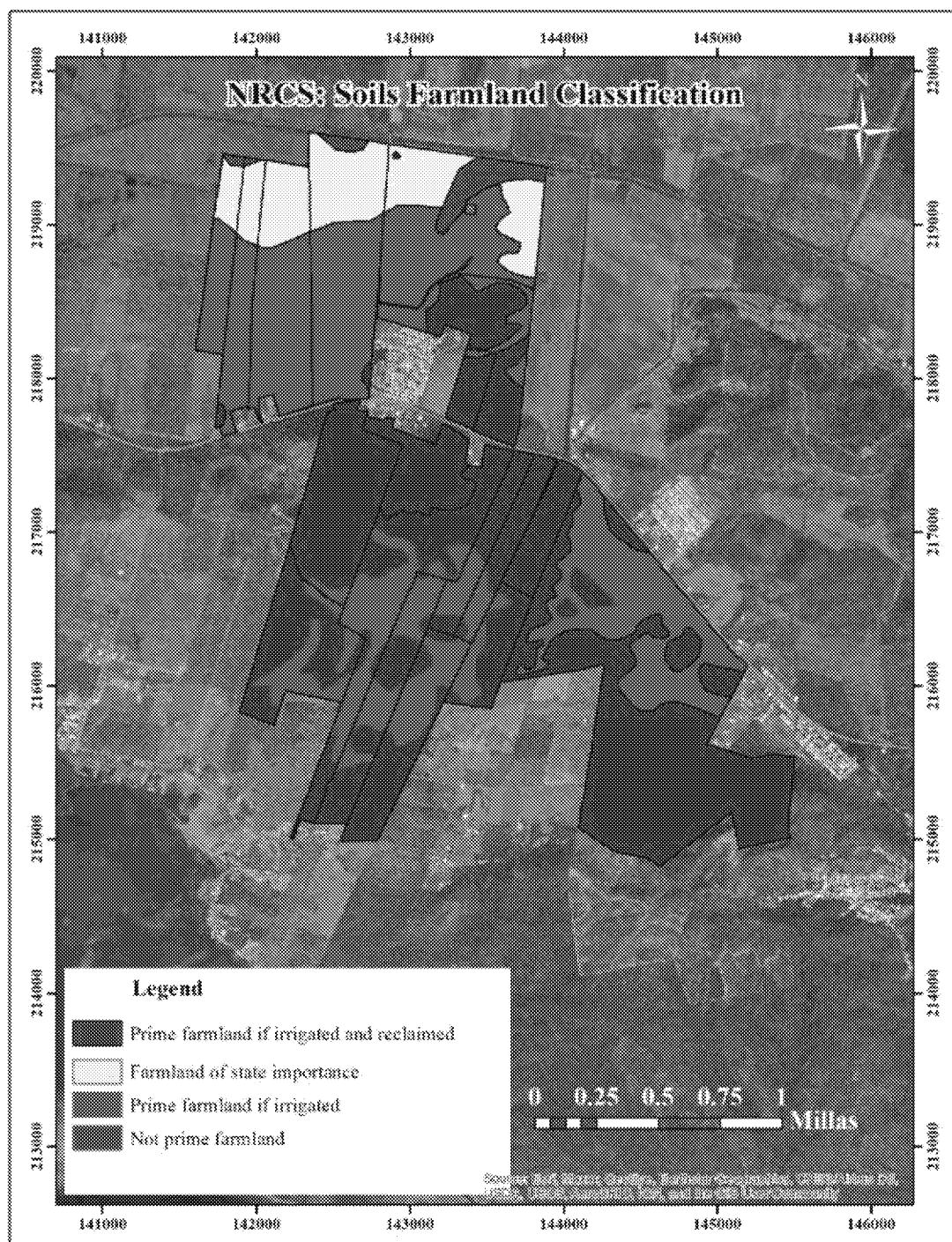
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Cuadro 3. Descripción taxonómica y área que ocupan los suelos en el área de construcción propuesta.

Serie	Orden	Suborden	Grupo	Subgrupo	Familia	Área (ha)	Área (%)
Urban	-	-	-	-	-	0.75	0.08
Aguilita	Mollisols	Ustolls	Calciustolls	Aridic Calciustolls	Coarse-loamy, carbonatic, isohyperthermic	1.58	0.16
Aguirre	Vertisols	Aquerts	Epiaquerts	Sodic Epiaquerts	Very-fine, smectitic, isohyperthermic	3.38	0.34
Melones	Vertisols	Torrerts	Calcitorrets	Chromic Calcitorrets	Fine, smectitic, isohyperthermic	12.00	1.20
Fe	Vertisols	Usterts	Haplusterts	Sodic Haplusterts	Fine, smectitic, isohyperthermic	13.72	1.37
San German	Mollisols	Ustolls	Haplustolls	Lithic Haplustolls	Clayey-skeletal, mixed, superactive, isohyperthermic	23.10	2.31
Costa	Entisols	Orthents	Torriorthent	Typic Torriorthent	Clayey, carbonatic, isohyperthermic, shallow	25.99	2.60
Pozo Blanco	Mollisols	Ustolls	Calciustolls	Aridic Calciustolls	Fine-loamy, mixed, superactive, isohyperthermic	32.49	3.25
Bermeja	Aridisols	Cambids	Haplocambids	Typic Haplocambids	Loamy, mixed, active, isohyperthermic, shallow	36.89	3.69
Parguera	Aridisols	Argids	Calciargids	Typic Calciargids	Clayey-skeletal, carbonatic, isohyperthermic	37.30	3.73
Montalva	Vertisols	Torrerts	Haplotorrets	Typic Haplotorrets	Fine, mixed, superactive, isohyperthermic	65.55	6.56
Cuchillas	Inceptisols	Udepts	Dystrudepts	Typic Dystrudepts	Loamy, mixed, active, isothermic, shallow	93.57	9.37
El Papayo	Aridisols	Cambids	Haplocambids	Typic Haplocambids	Clayey, mixed, superactive, isohyperthermic, shallow	94.22	9.43
Guayacan	Aridisols	Calcids	Haplocalcids	Typic Haplocalcids	Fine-loamy, mixed, superactive, isohyperthermic	94.52	9.46
Guanica	Vertisols	Aquerts	Calciaquerts	Typic Calciaquerts	Fine, smectitic, isohyperthermic	95.81	9.59
Fraternidad	Vertisols	Usterts	Haplusterts	Typic Haplusterts	Fine, smectitic, isohyperthermic	165.77	16.59
Altamira	Aridisols	Calcids	Haplocalcids	Typic Haplocalcids	Coarse-loamy, carbonatic, isohyperthermic	202.38	20.26
					Total	999.02	100.00

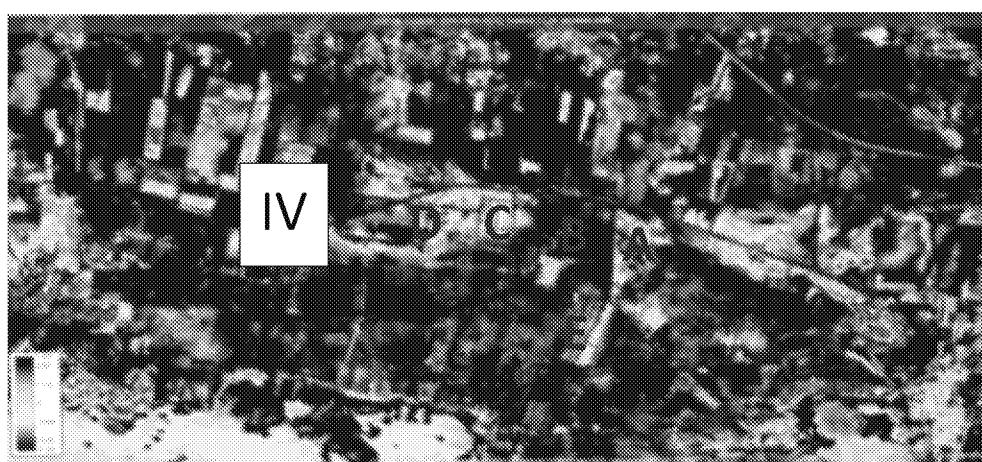
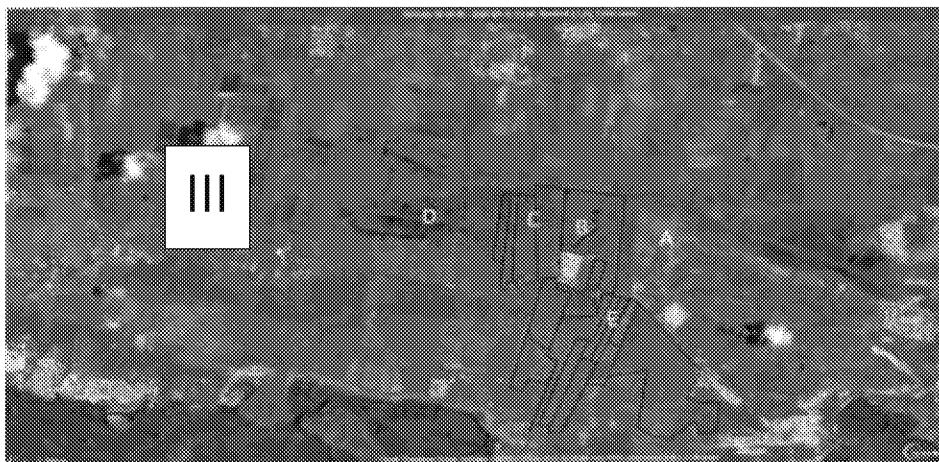
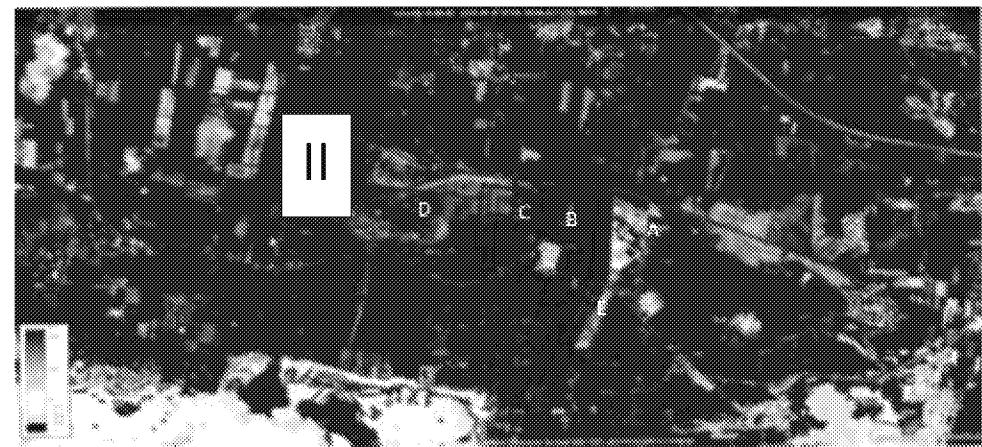
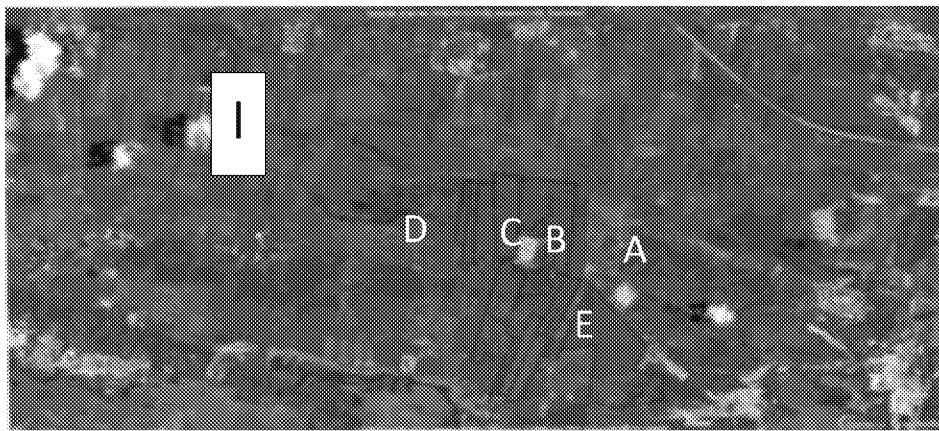
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 7. Distribución de área en suelos según Farmland Classification (USDA).



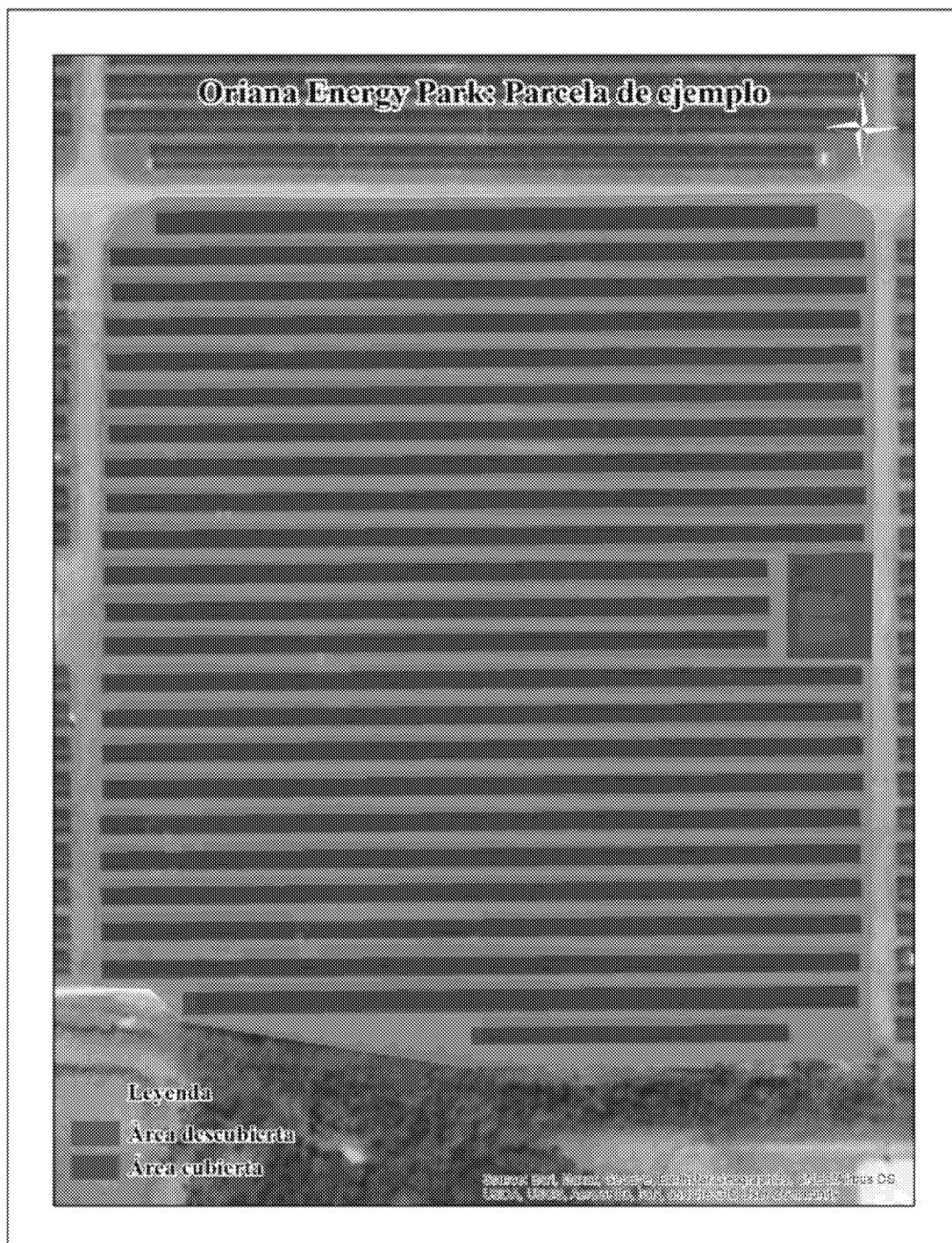
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 8. Imágenes satelitales de la zona demostrando la productividad de los suelos en (I) color natural; (II) falso color; (III) NDVI; (IV) humedad del suelo. Las áreas marcadas son: A- Finca Bayer; B – Humedal; C - Área agrícola de alta productividad; D – Área agrícola del Anegado que tiene acumulación transitoria de agua durante eventos de tormenta; E – Área vegetal removida entre julio y agosto 2020.



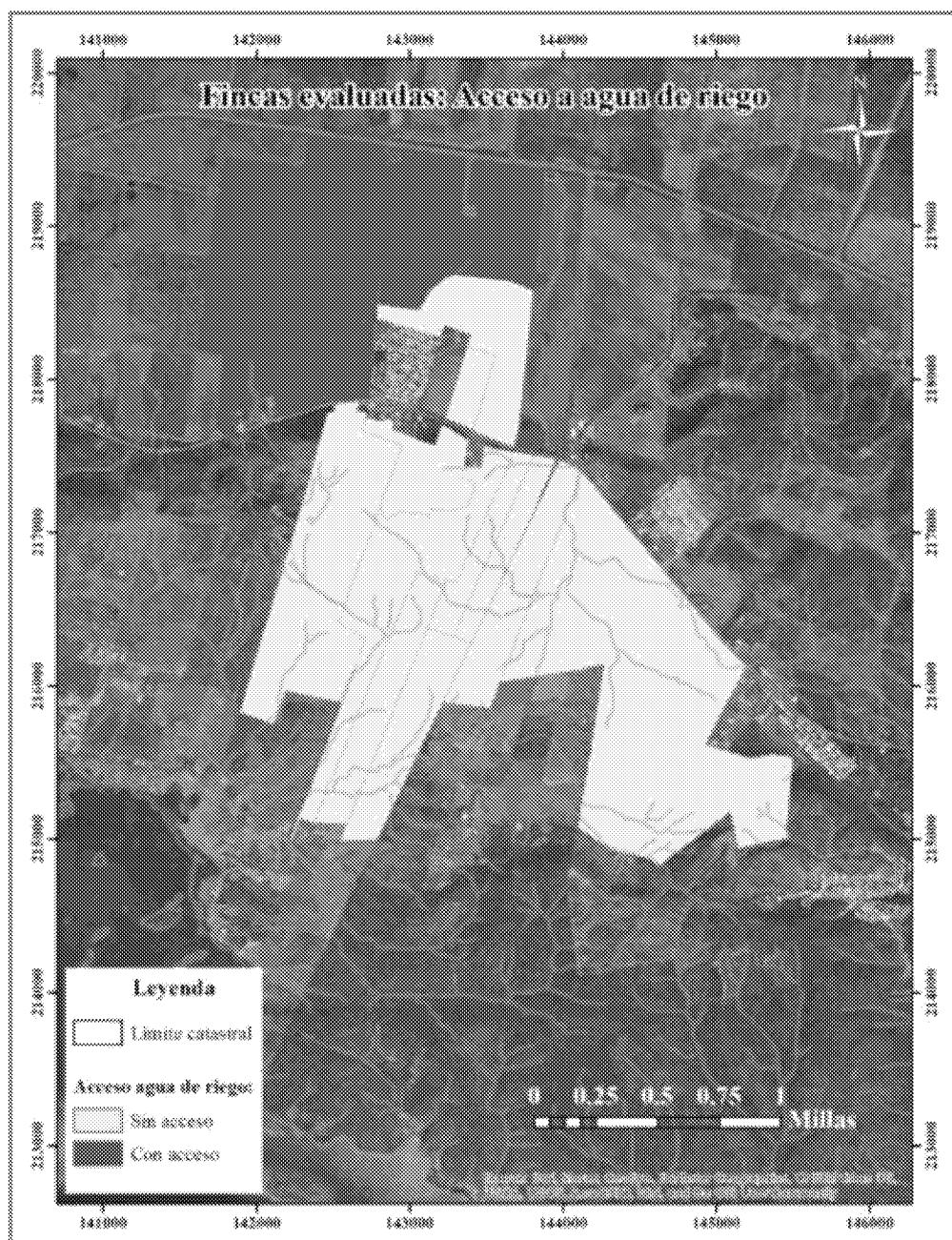
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 9. Esquema representativo de áreas de suelo cubierta por los módulos solares, en las facilidades de energía fotovoltaica Isabela.



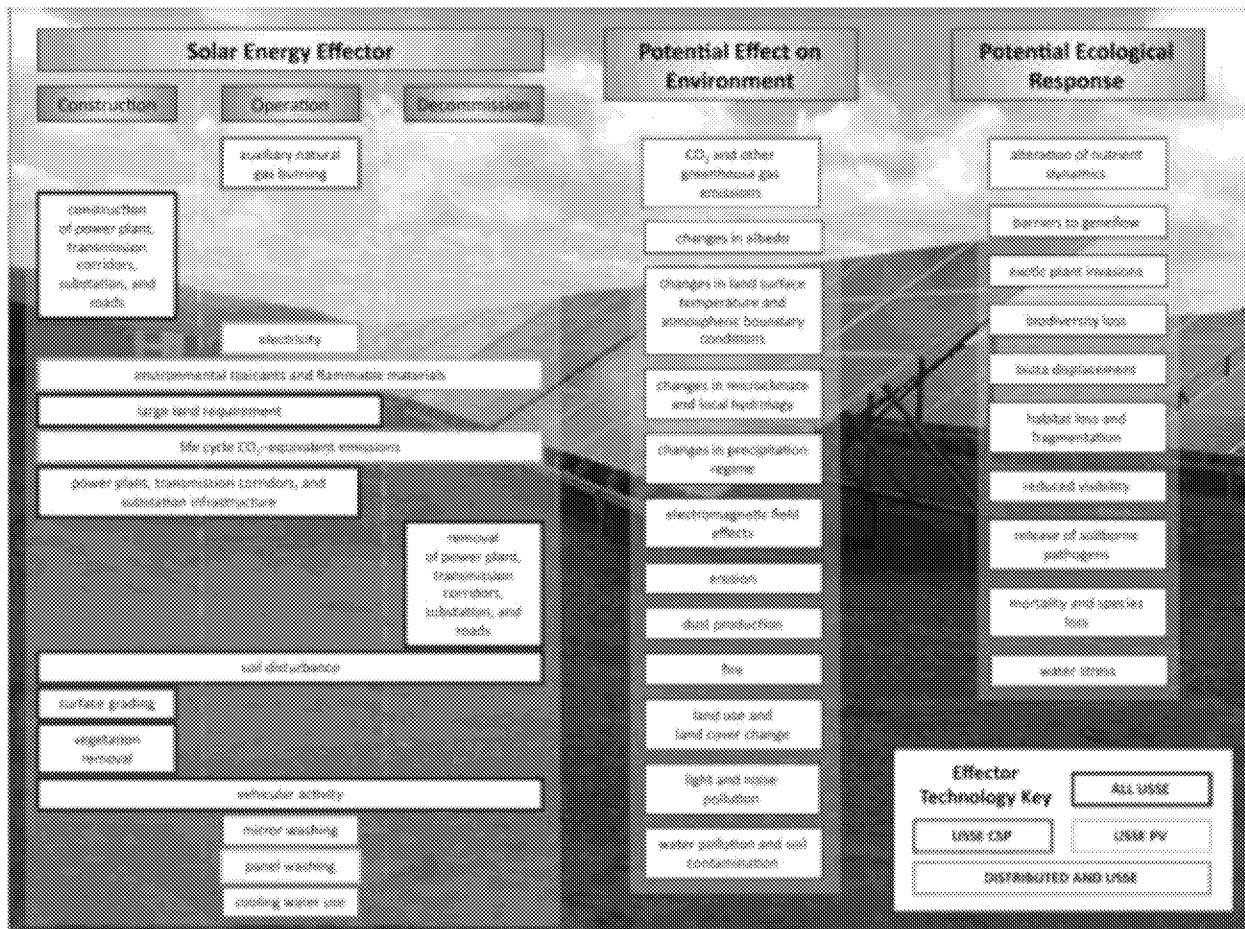
**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 10. Fincas con acceso a riego.



**Sotomayor Ramírez; Impacto de la construcción y operación del proyecto Montalva Solar Farm**  
**Figuras y cuadros del informe**

Figura 11. Posibles impactos de las fincas solares sobre el medioambiente (reproducido de Hernandez et al. 2013).



**GOVERNMENT OF PUERTO RICO  
PUBLIC SERVICE REGULATORY BOARD  
PUERTO RICO ENERGY BUREAU**

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**IN RE:**

**Review of the Puerto Rico Electric Power  
Authority Integrated Resource Plan**

**CASE NO.:  
CEPR-AP-2018-0001**

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**EXPERT TESTIMONY OF DANIEL GUTMAN  
ON BEHALF OF LOCAL ENVIRONMENTAL ORGANIZATIONS**

Comité Diálogo Ambiental, Inc., El Puente de Williamsburg, Inc. -Enlace Latino de Acción Climática, Comité Yabucoeño Pro-Calidad de Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club and its Puerto Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti-Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas, Inc., and CAMBIO Puerto Rico, Inc.

1       **I. Introduction and Qualifications**

2

3       **Q: Please state your name, position, and business address:**

4       **A:** My name is Daniel Gutman. I am a consultant in environmental analysis of air pollution. My  
5       business address is 407 West 44th Street, New York, New York 10036.

6

7       **Q: On whose behalf are you testifying in this proceeding?**

8       **A:** I am testifying on behalf of the following organizations: Comité Diálogo Ambiental, Inc., El  
9       Puente de Williamsburg, Inc.- Enlace de Acción Climática, Comité Yabucoeño Pro-Calidad de  
10      Vida, Inc., Alianza Comunitaria Ambientalista del Sureste, Inc., Sierra Club, Inc. and its Puerto  
11      Rico chapter, Mayagüezanos por la Salud y el Ambiente, Inc., Coalición de Organizaciones Anti  
12      Incineración, Inc., Amigos del Río Guaynabo, Inc., Campamento Contra las Cenizas en Peñuelas,  
13      Inc. CAMBIO PR, Inc.

14

15       **Q: Please summarize your qualifications and work experience.**

16       **A:** In more than a dozen matters, I have provided expert analysis of the harmful impacts of  
17      emissions from utility projects on human health. I have testified before administrative agencies as  
18      an expert, on behalf of the Environmental Protection Agency (EPA) and local environmental  
19      organizations. I hold a Bachelor of Science degree from the Massachusetts Institute of Technology  
20      and a Master of Science degree from the University of Illinois. My resume is attached as Exhibit  
21      A.

1      **Q: What is the scope of your testimony?**

2      **A:** I have been asked to review the air quality surrounding the major power plants in Puerto Rico  
3      and the implications of continued operation of the Puerto Rico Electric Power Authority (PREPA)  
4      power plants for air quality and public health.

5

6      **II.     PREPA's Violations and Health Impacts from Emissions at Puerto Rico's Fossil  
7               Fuel Power Plants**

8

9      **Q: What are the conclusions of your review?**

10     **A:** My review indicates that if the current power plant output and fuel type are maintained in the  
11     future, then the area surrounding the Puerto Rico Electrical Power Authority (PREPA) power  
12     plants at Costa Sur, San Juan, and Aguirre will fail to comply with the Environmental Protection  
13     Agency's (EPA) 2010 sulfur dioxide National Ambient Air Quality Standard (NAAQS). The  
14     2010 NAAQS sulfur dioxide standard was based on new health research that established for the  
15     first time a causal relationship between respiratory morbidity and short-term sulfur dioxide  
16     concentrations (75 FR 35525). Therefore, my review indicates that continued operation of these  
17     plants will cause harmful health impacts to Puerto Ricans living nearby.

18

19     **Q: Considering the importance of compliance with the 2010 sulfur dioxide standard, what  
20               are your views for PREPA's preferred plans in the Integrated Resource Plan (IRP)?**

21     **A:** Because of the expense and difficulty of either adding pollution control equipment or cleaner  
22     fuel, the best way for Puerto Rico to comply with the 2010 sulfur dioxide standard is for PREPA  
23     to move away from generation in fossil fuel power plants and toward generation from non-

1 polluting sources. PREPA's preferred plans, the Energy System Modernization Plan (ESM) and  
2 Scenario 4, invest too many resources into fossil fuel generation, and not enough in non-polluting  
3 sources.

4

5 **Q: Please explain the air quality standards that PREPA must meet.**

6 **A:** The Clean Air Act sets up a regulatory framework whose main purpose is protection and  
7 enhancement of air quality. To achieve this purpose, the Clean Air Act encompasses broad  
8 authority for EPA to evaluate health effects of air pollutants, set ambient air pollution standards,  
9 set emission standards for both new and existing equipment, and require states to submit plans to  
10 control air pollutants (or have EPA adopt its own plan).

11 Under §108 of the Clean Air Act, EPA issues "air quality criteria" to control certain air pollutants  
12 that are widespread in the human environment, largely because they are emitted whenever fuel is  
13 burned. These include sulfur dioxide, carbon monoxide, nitrogen oxides, particulate matter,  
14 ozone, and lead. Under §109 of the Clean Air Act, EPA has set National Ambient Air Quality  
15 Standards (NAAQS) "requisite to protect the public health" for each of these pollutants, which  
16 apply wherever the public is exposed. States submit plans under §110 to achieve NAAQS by dates  
17 set by EPA. Plans can include mechanisms such as state regulation of fuel type, required permits  
18 for major polluters (Clean Air Act, §172), economic incentives, etc. Since ambient concentrations  
19 are proportional to emissions, the purpose of the plan is to reduce emissions enough to meet  
20 ambient standards. EPA typically helps the states by setting emission standards for equipment,  
21 providing research on effectiveness of control techniques, providing guidance on developing a  
22 plan, and many other activities.

23

1   **Q: Why are these air quality standards especially important in Puerto Rico?**

2   **A:** In 2010, EPA adopted a stricter NAAQS for sulfur dioxide (75 FR 35520). This is particularly  
3   relevant in Puerto Rico, where power plants emit significant levels of this toxic chemical. The  
4   new standard is primarily designed to limit short-term high concentrations of sulfur dioxide that  
5   cause breathing problems. Short-term peaks of sulfur dioxide cause constriction of bronchial  
6   passageways and respiratory symptoms in susceptible populations, which include children, older  
7   adults, those with pre-existing respiratory disease, those who spend time exercising outdoors,  
8   persons of lower socio-economic status, and asthmatic individuals. Notably, the prevalence and  
9   severity of asthma is higher among Puerto Ricans (75 FR 35527). The health data,  
10   epidemiological, human exposure, and other data on the relationship between short-term sulfur  
11   dioxide exposure and adverse respiratory effects is convincing enough for the relationship to be  
12   characterized as causal, the “strongest finding” that EPA can make (75 FR 35520 [2010]).

13  
14   **Q: How does EPA determine compliance with standards in Puerto Rico?**

15   **A:** EPA set a one-hour limit of 75 ppb (parts per billion) for sulfur dioxide, based on a three-year  
16   average of the 99th percentile daily maximum sulfur dioxide concentrations in an area. A short-  
17   term standard at the level adopted by EPA will reduce longer-term sulfur dioxide concentrations  
18   as well. Consequently, EPA eliminated its previous 24-hour and yearly average standards at the  
19   same time as it adopted a one-hour standard.

20   EPA recognized that violations of the 2010 sulfur dioxide standard could be expected near large  
21   facilities that burn oil or coal and emit more 2,000 tons of sulfur dioxide per year. EPA accordingly  
22   determined that areas near those facilities are of special concern. Prior to submitting a plan to  
23   meet the 2010 sulfur dioxide standard, air agencies must first determine whether their air is in

1 attainment or non-attainment with the standard. While air agencies could characterize their air  
2 quality using an existing air quality monitoring network, Puerto Rico's network apparently does  
3 not meet minimum standards for data collection. Consequently Puerto Rico characterized its air  
4 primarily using computer modeling, in accordance with EPA regulations (40 CFR §51.1203).

5

6 **Q: Are PREPA's power plants in compliance with air quality standards?**

7 **A:** No. In 2016, the Puerto Rico Environmental Quality Board (EQB) found that the areas around  
8 four PREPA power plants are likely in violation of the 2010 sulfur dioxide NAAQS—including  
9 the Aguirre, Costa Sur, San Juan, and Palo Seco plants. The EQB projections, based on actual  
10 sulfur dioxide emissions during the years 2013-15, are shown in the table below.<sup>1</sup>

11 Table 1. Summary of the Puerto Rico 1-hour SO<sub>2</sub> Designation Modeling Results, 2016.

Emission Sources with SO <sub>2</sub> emissions at or above 2,000 tpy	Name of geographical area	Maximum impact area (radius in kilometers)	1-Hour SO <sub>2</sub> Design Value ( $\mu\text{g}/\text{m}^3$ )	1-hour SO <sub>2</sub> NAAQS ( $\mu\text{g}/\text{m}^3$ )
PREPA Aguirre	Guayama-Salinas	5.4	232	196*
PREPA Costa Sur	Guayanilla	7.0	1,046	
PREPA San Juan	San Juan	3.6	343	
PREPA Palo Seco	San Juan	2.7	207	

12 \* For sulfur dioxide, 196  $\mu\text{g}/\text{m}^3$  is equivalent to 75 ppb.

13 The EQB is expected to submit to EPA its Implementation Plan for achieving compliance with  
14 the 2010 sulfur dioxide standard later this year.<sup>2</sup> PREPA has three difficult options to achieve  
15 compliance, if it wishes to keep these plants running:

<sup>1</sup> Letter from EQB to EPA, December 19, 2016. A true and accurate copy of this letter, with Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Results including Appendix A, is attached as [Exhibit B](#).

<sup>2</sup> See “Status of SIP Required Elements for Puerto Rico Designated Areas,” at [https://www3.epa.gov/airquality/urbanair/sipstatus/reports/pr\\_elembypoll.html](https://www3.epa.gov/airquality/urbanair/sipstatus/reports/pr_elembypoll.html).

- 1      • Lower the sulfur content of the oil burned at PREPA's power plants
- 2      • Install emission control equipment, or
- 3      • Reduce the maximum power generated.

4

5      **Q: Can control equipment be effectively applied in Puerto Rico?**

6      **A:** A previous study by Puerto Rico's Intersectoral Committee on Environmental Compliance and  
7      Energy Alternatives (ICECEA), convened by the Governor of Puerto Rico, found that three of the  
8      four power plants do not have the space for control equipment and that, in any case, the cost of  
9      installing and operating the equipment would have the effect of increasing the cost of electricity,  
10     making control equipment "not a viable compliance alternative."<sup>3</sup> The study also determined that  
11     using a lower sulfur fuel, for example one containing 0.3% sulfur instead of the current 0.5%  
12     sulfur, "is not an option, as it would increase energy costs significantly and would not comply with  
13     emission limits for contaminants imposed by new federal regulations."<sup>4</sup>

---

<sup>3</sup> ICECEA, Report on the Necessary Measures to Comply With New EPA Regulations, and the Conversion to, and Use of Natural Gas in, the Northern Power Plants 13, June 15, 2012, <http://www.gdb.pr.gov/documents/FINAL-InformeCICAAEGobernador-English-firmado.pdf>

<sup>4</sup> *Id.*

1        According to the ICECEA report:

2                  As part of our evaluation, both the EQB and PREPA used dispersion  
3                  models in order to determine the generating units' maximum  
4                  emission levels. Both agencies agreed that in order to meet NAAQS  
5                  compliance, [PREPA] must burn liquid fuel with a sulfur content of  
6                  0.1 percent per weight or less. This would imply that PREPA would  
7                  be burning diesel in all of its combustion units. Currently, this fuel  
8                  is only utilized in the most efficient combined cycle units, since its  
9                  high cost is not economically feasible for use in other units.  
10                 Increasing the use of No. 2 diesel fuel in turn increases the cost of  
11                 fuel purchases.<sup>5</sup>

12                 Furthermore, PREPA's current fuel risks exacerbating its non-compliance with the 2010 sulfur  
13                 dioxide standard. Two power plants in Puerto Rico, the Aguirre and Palo Seco plants, are  
14                 operating substantially below capacity, as shown in Table 2. If operations at either plant increase  
15                 in the future without adding pollution control equipment or reducing the sulfur content of the fuel,  
16                 sulfur dioxide emissions, and therefore sulfur dioxide concentrations, will increase above those  
17                 projected in Table 1.

19                 Table 2. Large SO<sub>2</sub> Sources in Puerto Rico.

Emission sources with SO <sub>2</sub> emissions at or above 2,000 tons/year	Name of geographical area	SO <sub>2</sub> Emissions (tons/yr)				Average Emissions as % of Allowable
		Allowable*	2013	2014	2015	
PREPA Aguirre	Guayama-Salinas	30,038	9,641	9,261	9,585	32%
PREPA Costa Sur	Guayanilla	11,506	6,975	8,337	9,323	71%
PREPA San Juan	San Juan	7,787	5,308	5,136	6,064	71%
PREPA Palo Seco	San Juan	17,344	5,701	3,128	2,979	23%

20                 \* Exhibit B, Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Results, Appendix A.

---

<sup>5</sup> *Id.*

1   **Q: What would happen if current emissions levels were maintained?**

2   **A:** If current emission levels are maintained in the future, areas surrounding the Palo Seco plant  
3   will comply with the 2010 sulfur dioxide NAAQS, while areas surrounding the other plants will  
4   continue to be in non-compliance. Modeling results show that the Palo Seco area did comply with  
5   the sulfur dioxide concentration standard in 2014 and 2015, but that the three-year average was  
6   pushed above compliance due to higher plant emissions in 2013, as shown in Table 3. If sulfur  
7   dioxide emissions from Palo Seco are maintained at the 2014-15 level, the surrounding area will  
8   eventually comply with the standard, which is based on a three-year average.

9                 Table 3. Puerto Rico 1-hour SO<sub>2</sub> Designation Modeling Results, 2013–15.<sup>6</sup>

Emission sources with SO <sub>2</sub> emissions at or above 2,000 tons/year	Name of geographical area	SO <sub>2</sub> Concentrations (µg/m <sup>3</sup> )			1-hour SO <sub>2</sub> NAAQS (µg/m <sup>3</sup> )
		2013	2014	2015	
PREPA Aguirre	Guayama-Salinas	236	226	233	196*
PREPA Costa Sur	Guayanilla	1,003	1,037	1,098	
PREPA San Juan	San Juan	316	325	387	
PREPA Palo Seco	San Juan	263	172	185	

10                 \* For sulfur dioxide, 196 µg/m<sup>3</sup> is equivalent to 75 ppb.

11          If the current power plant output and fuel type are maintained in the future, then the area  
12          surrounding the PREPA Palo Seco power plant is the only area that can comply with EPA's 2010  
13          sulfur dioxide NAAQS. Areas surrounding the other major PREPA power plants—Costa Sur, San  
14          Juan, and Aguirre—will not be able to achieve compliance with that important health-based  
15          standard.

---

<sup>6</sup> Exhibit B, Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Results, Appendix A.

1 Because of the expense and difficulty of either adding pollution control equipment or cleaner fuel,  
2 the best way for Puerto Rico to comply with the 2010 sulfur dioxide standard is for PREPA to  
3 move away from generation in fossil fuel power plants and toward generation from non-polluting  
4 sources, as required by the recent Climate Change Mitigation, Adaption and Resiliency Law signed  
5 by Governor Ricardo Rosselló.<sup>7</sup> The requirements of this law should be reflected in Puerto Rico's  
6 forthcoming Implementation Plan for achieving the sulfur dioxide NAAQS.

7

8 **Q: What has been PREPA's history in terms of compliance with sulfur dioxide standards?**

9 **A:** PREPA has a history of poor compliance or non-compliance with federal air and water quality  
10 regulations governing its power plants. Prior to 1999, PREPA allowed virtually uncontrolled  
11 emissions of sulfur dioxide mist from its power plants, polluting nearby air and creating health  
12 problems for nearby residents.<sup>8</sup> A 1999 consent decree between PREPA and EPA, modified in  
13 2004, addressed those failures in part by restricting the sulfur content of fuel burned at PREPA's  
14 facilities. Subsequent to the consent decree PREPA has apparently engaged in a scheme to falsify  
15 tests of fuel quality required by the consent decree.<sup>9</sup>

16 Provisions of the consent decree are incorporated into Title V air permits issued by the EQB. In  
17 addition to the sulfur content of fuel, these provisions include several aimed at ensuring proper  
18 maintenance and optimum operating conditions of the Aguirre power station. Title V of the Clean  
19 Air Act was adopted in order to consolidate the issuance and enforcement of permits under the  
20 authority of one agency (42 USC Chapter 85, subchapter V). Given PREPA's previous bad

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<sup>7</sup> See Governor Ricardo Rosselló Signs Historic Climate Change Bill," May 23, 2019, available at <http://prfaa.pr.gov/governor-ricardo-rossello-signs-historic-climate-change-bill/>.

<sup>8</sup> Mary Williams Walsh, "At Puerto Rico's Power Company, a Recipe for Toxic Air, and Debt," New York Times, February 16, 2016, available at <https://www.nytimes.com/2016/02/16/business/dealbook/at-puerto-ricos-power-company-a-recipe-for-toxic-air-and-debt.html>.

<sup>9</sup> *Id.*

1 behavior, it is important that one agency, in this case the EQB, has oversight and enforcement  
2 authority over all activities covered by the Title V permit, including those provisions added as a  
3 result of the 2004 consent decree.

4 In particular, among PREPA's large power plants, PREPA's Aguirre power complex emits the  
5 most sulfur dioxide, while the Palo Seco power plant emits the least, as shown in Table 2 above.  
6 The area around the Aguirre plant does not comply with the 2010 sulfur dioxide NAAQS, as shown  
7 in Table 3, above.<sup>10</sup> Palo Seco is the only plant that could meet the 2010 sulfur dioxide standard  
8 while using the current fuel—0.5% sulfur oil. Consequently no modifications should be allowed  
9 to PREPA Aguirre's Title V permit that may dilute EQB's enforcement authority, since any such  
10 modification could hamper enforcement by EQB and weaken compliance with conditions of the  
11 permit, making the existing violation of the 2010 sulfur dioxide NAAQS worse and endangering  
12 the health of nearby residents.

13

14 **Q: What other pollutants are emitted by PREPA's power plants?**

15 **A:** Sulfur dioxide is only one of the pollutants emitted from PREPA's power plants. Emissions of  
16 other criteria pollutants are shown in Table 4, below. Of particular concern are emissions of  
17 nitrogen oxides, which contribute to formation of ozone (80 FR 65292 [2015]). and emissions of  
18 particulate matter—PM<sub>10</sub> and PM<sub>2.5</sub>—which exacerbate asthma symptoms and adversely impact  
19 respiratory function, especially of children, in the short term and increase death rates, especially  
20 of the elderly, in the long term (78 FR 3085 [2013]).

21

---

<sup>10</sup> The PREPA Aguirre Power Complex also does not comply with its Clean Water Act (CWA) permit. See <https://echo.epa.gov/detailed-facility-report?fid=110000307800#pane3110000307800>.

1           Table 4. Criteria Pollutants Emitted by PREPA Power Plants in 2014 (tons/year).<sup>11</sup>

Emissions Source	Carbon Monoxide	Nitrogen Oxides	PM 10	PM 2.5	Sulfur Dioxide	VOC
PREPA Aguirre	6287,0866985	199,26495				
PREPA Costa Sur	3278,89787	66778,33630				
PREPA San Juan	1,0704,0874	682824,90340				
PREPA Palo Seco	2082,40723	01673,12532				

2  
3       A review of monitoring data that the EQB submits to EPA shows that EQB's monitoring program  
4       is substandard. Most EQB monitors fail to collect sufficient data to even determine whether areas  
5       of Puerto Rico meet federal air quality standards. Sometimes when EQB monitors do collect  
6       sufficient data, they show what should be violations of the federal standard. For example, in 2016,  
7       EQB ozone monitors showed violations of the federal one-hour ozone standard in Bayamón,  
8       Cataño, and Juncos municipalities. Unfortunately EPA revoked the one-hour ozone standard in  
9       1997 believing that a new, lower 8-hour standard would protect against both short-term (1–3 hours)  
10      and medium-term (6–8 hours) exposures (62 FR 38856 [1997]). In Puerto Rico this appears not  
11      to have been the case. Consequently, emissions of nitrogen oxides from PREPA's fossil fuel  
12      power plants continue to pose a health hazard for island residents.

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<sup>11</sup> EPA, Enforcement and Compliance History Online (ECHO) Air Pollutant Reports, available at <https://echo.epa.gov/>.

1   **Q: What emissions are the comparable emissions for the AES Puerto Rico and EcoElectrica**  
2   **power plants?**

3   **A:** Emissions for the AES and EcoElectrica power plants are shown in the Table 5.

4              Table 5. Criteria Pollutants Emitted by Other Power Plants in 2014 (tons/year).<sup>12</sup>

Emission Source	Carbon Monoxide	Nitrogen Oxides	PM 10	PM 2.5	Sulfur Dioxide	VOC
AES Puerto Rico	861	1,729	402	100	245	7
EcoElectrica, L.P.	204	311	49	49	0	7

5  
6   **Q: Does this conclude your testimony?**  
7   **A:** Yes.

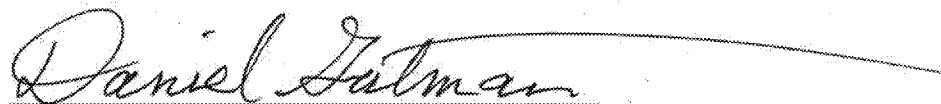
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<sup>12</sup> EPA, Enforcement and Compliance History Online (ECHO) Air Pollutant Reports, available at <https://echo.epa.gov/> and EPA emission factors, AP-42, at <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors>.

## CERTIFICATION

I, Daniel Gutman, CERTIFY that the contents of my testimony are known to me and are the truth according to the best of my abilities and reasonable knowledge. The technical and operational aspects included in the testimony are based on information that has been gathered in good faith; but I cannot guarantee the truthfulness of information gathered from third parties.



Daniel Gutman

Daniel Gutman, M.S.

Before me, the undersigned Notary Public, personally appeared Daniel Gutman, who acknowledges that the above is true this day of October 23, 2019 in New York, NY.

Personally known OR

Identification Document provided Driver's License.

JONATHAN JAMES SMITH  
NOTARY PUBLIC-STATE OF NEW YORK  
NO. 02SM6335228  
QUALIFIED IN NEW YORK COUNTY  
MY COMMISSION EXPIRES 01-04-2020

Notary Public Name, Signature, Seal



Jonathan James Smith  
New York City, NY

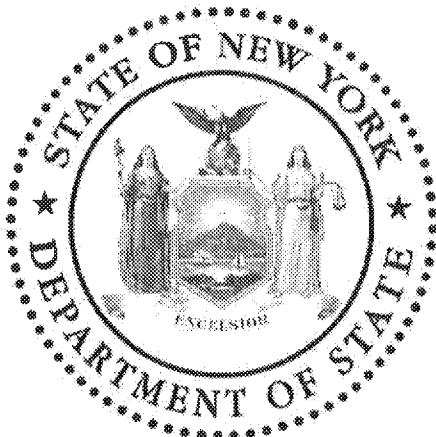
# *Apostille*

(Convention de La Haye du 5 Octobre 1961)

1. Country: United States of America  
This public document
2. has been signed by **Milton Adair Tingling**
3. acting in the capacity of **County Clerk**
4. bears the seal/stamp of the **county of New York**

Certified

5. at New York City, New York
6. the 23rd day of October 2019
7. by Deputy Secretary of State for Business and Licensing Services, State of New York
8. No. NYC-1357280
9. Seal/Stamp
10. Signature



*Whitney A Clark*

Whitney A. Clark

Deputy Secretary of State for Business and Licensing Services

State of New York }  
County of New York }

No. 618501

I, Milton Adair Tingling, Clerk of the County of New York, and Clerk of the Supreme Court in and for said county, the same being a court of record having a seal, DO HEREBY CERTIFY THAT

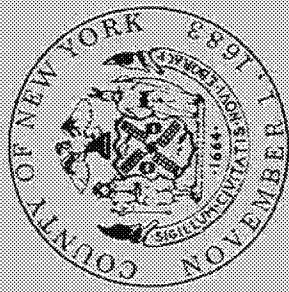
**JONATHAN JAMES SMITH**

whose name is subscribed to the annexed original instrument has been commissioned and qualified as a NOTARY PUBLIC..... and has filed his/her original signature in this office, and that he/she was at the time of taking such proof or acknowledgment or oath duly authorized by the laws of the State of New York to take the same; that he/she is well acquainted with the handwriting of such public officer or has compared the signature on the certificate of proof or acknowledgment or oath with the original signature filed in his/her office by such public officer and he/she believes that the signature on the original instrument is genuine.

IN WITNESS WHEREOF, I have hereunto set my hand and my official seal this  
23rd day of October, 2019



County Clerk, New York County



CLERK / DUNTY

**Daniel Gutman  
407 West 44th Street  
New York, New York 10036  
212 586-3888**

Education:

Massachusetts Institute of Technology  
Cambridge, Massachusetts

B.S., Physics  
June, 1964

University of Illinois  
Urbana, Illinois

M.S., Physics  
February, 1966

Summary of Consulting Experience:

Environmental Protection Agency

Chief analyst for the United States Environmental Protection Agency on traffic and environmental impacts of Westway, a highway proposed for Manhattan. Responsible for preparing cross-examination of State Department of Transportation witnesses and for developing and presenting EPA's direct testimony during administrative hearings.

Environmental Defense Fund  
Scenic Hudson

Analyzed the local impact of increased sulfur dioxide emissions due to the proposed conversion to high-sulfur coal of Orange and Rockland's Lovett and Danskammer, and the conversion to coal of Con Edison's Arthur Kill and Ravenswood power plants for presentation at administrative hearings.

The Municipal Art Society  
STAND  
The ATURA Coalition  
Committee to Preserve Brighton Beach and  
Manhattan Beach

Conducted traffic and air pollution analyses of several major development projects in New York City, including the Coliseum Redevelopment, Metrotech, Atlantic Terminal, and Brighton Beach projects.

Union of Concerned Scientists

Analyzed the potential for accidental releases of radioactive gases reaching New York City from the nearby Indian Point nuclear reactor.

Environmental Defense Fund  
Natural Resources Defense Council

Provided technical analysis and evaluations of EPA regulations concerning all sulfur dioxide emitting facilities, as well as those specifically applying to copper smelters.

Association to Save the Hutch  
Montgomery Township, New Jersey  
Elizabeth and East Brunswick, New Jersey

Provided analyses of the air pollution and traffic impacts of the proposed expansions of the Hutchinson River Parkway, Route US 206 through Montgomery Township, and the New Jersey Turnpike.

Port Authority of New York and New Jersey

Evaluated the impacts of diesel particulates and carbon monoxide due to a proposed busway connecting the Holland and Lincoln tunnels just outside New York City.

Environmental Defense Fund

Investigated the environmental impacts of both toxic and non-toxic emissions from waste-to-energy resource recovery plant proposed for New York City for presentation at administrative hearing.

Citizens for Westpride

Analyzed traffic, air pollution, noise, sewage disposal, and zoning and density with respect to both a massive development proposed by the Trump Organization for a disused rail yard on the West Side of Manhattan, and a number of other projects in the immediate area.

The Parks Council  
The Municipal Art Society  
The Regional Plan Association

Devised a smaller-scale, more civic-minded alternative to the Trump project, based on relocating a portion of the West Side Highway in order to extend Riverside Park.  
Evaluated the air pollution and noise impacts of the relocated West Side Highway and investigated various noise control techniques. Known as Riverside South, this alternative was ultimately embraced by the developer and approved by the City.

The Municipal Art Society  
Beekman Hill Association

Studied potential air pollution impacts of Con Edison's Waterside power plant in New York City on a proposed very tall, nearby building.

Environmental Defense

New York Lawyers for the Public Interest

Analyzed air quality impacts of diesel emissions from a proposed waste transfer station on nearby residential areas as part of an administrative hearing. Developed legal and technical arguments to require an air quality analysis of fine particulate matter (PM 2.5).

East River Environmental Coalition

Manhattan Community Board #3

In connection with an application by Con Edison to add two electric and steam generators to the East River power plant, analyzed air quality impacts, focussing on fine particulate matter, evaluated noise impacts, helped develop alternative proposals, analyzed the air quality and land-use impacts of the alternatives, and represented client groups in administrative hearings.

Natural Resources Defense Council

Coalition Helping Organize a Cleaner Environment

Borough President of Queens, New York

In connection with applications by Keyspan, SCS Astoria, Orion Power, and the New York Power Authority to add power plants in the Astoria section of New York City, analyzed air quality impacts, focussing on fine particulate matter, analyzed the air quality impacts of the alternatives, and represented client groups in administrative hearings.

Adirondack Communities Advisory League

Presented testimony in administrative hearings regarding impacts of toxic air emissions from a proposed landfill in Ava, New York.

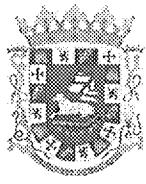
Greenpoint/Williamsburg Waterfront Task Force

Borough President of Brooklyn, New York

In connection with an application by TransGas Energy to add power plants in the Greenpoint/Williamsburg section of New York City, analyzed air quality impacts, focussing on fine particulate matter, analyzed the air quality impacts of the alternatives, and represented client groups in administrative hearings.

Hell's Kitchen Neighborhood Association

Prepared a major zoning and land use plan for the West Side of Manhattan between 30th and 42nd streets as an alternative to City-sponsored plan.



**COMMONWEALTH OF  
PUERTO RICO**  
Environmental Quality Board

December 19<sup>th</sup> 2016

MRS. JUDITH A. ENCK  
REGIONAL ADMINISTRATOR  
USEPA -REGION 2  
290 BROADWAY  
NEW YORK NY 10007-1866

Dear Mrs. Enck:

**PUERTO RICO'S MODELING RESULTS FOR THE 2010 PRIMARY S02 NAAQS  
RECOMMENDATION FOR NON-ATTAINMENT AREAS DESIGNATION**

As required by Title 40 of the Code of Federal Regulations, Section 51.1203(d)(3), Air Agencies shall conduct and submit to the EPA Regional Office the Modeling Analysis for Emission Sources with S0<sub>2</sub> emissions on or above 2,000 tons per year (tpy), for its associate area and nearby area. Air Agencies shall conduct and submit Modeling Analysis on or before January 13<sup>th</sup> 2017.

PREQB performed a 1-hour S02 Designation Modeling Analysis for the following geographical areas of the Commonwealth of Puerto Rico: Guayama-Salinas, Guayanilla and San Juan. Table 1 summarizes Modeling Results.

Table 1. Summary of the Puerto Rico 1-hour S02 Designation Modeling Results.

Emission Sources with S02 emissions on or above 2,000 tpy	Name of Geographical area	Maximum impact area (radius in kilometers)	1-Hour S02 Design Value ( $\mu\text{g}/\text{m}^3$ )	1-hour S02 NAAQS ( $\mu\text{g}/\text{m}^3$ )
PREPA Aguirre	Guayama-Salinas	5.4	232	196
PREPA Costa Sur	Guayanilla	7.0	1,046	
PREPA San Juan	San Juan	3.6	343	
PREPA Palo Seco	San Juan	2.7	207	

According to the modeling results, the S02 emissions of the four facilities included in the study do not comply with the 1-hour S02 NAAQS of 196  $\mu\text{g}/\text{m}^3$ .

Puerto Rico's Modeling Results for the 2010 Primary S02 NAAQS

Recommendation for Non-Attainment Areas Designation

Page 2

Based on the Modeling Results, PREQB recommends to EPA the designation of Guayama-Salinas, Guayanilla and San Juan as Non-Attainment Areas for the 1-hour S02 NAAQS, and the designation of Unclassified/Attainment Area for the remaining geographical areas of the Commonwealth of Puerto Rico.

If you have any question, please, feel free to contact the PREQB's Air Quality Manager at (787)767-8181 x-3269, or Mrs. Lucia Fernandez, Chief of the Air Monitoring, Validation & Data Management Division at (787)767-8181 x-3254.

Cordially,



Weldon Ortiz-Franco  
Chairman

Enclosure: *Puerto Rico I-hour S02 Designation Modeling Results*

c      Mr. John Filippelli, CASO Director  
         Mr. Richard Ruvo, EPA Air Program Branch Director  
         Mrs. Carmen Guerrero, CEPD Director

PUERTO RICO 1-HOUR SO<sub>2</sub> DESIGNATION MODELING RESULTS

PUERTO RICO ENVIRONMENTAL QUALITY BOARD  
AIR MONITORING, VALIDATION & DATA MANAGEMENT

SEPTEMBER 2016

## Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board

1-Hour SO<sub>2</sub> Designation Modeling Results

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1-Hour SO<sub>2</sub> Designation Modeling Results

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1-Hour SO<sub>2</sub> Designation Modeling Results

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List of Acronyms

DRR	Data Requirements Rule
NAAQS	National Ambient Air Quality Standards
SO <sub>2</sub>	Sulfur Dioxide
PPB	Parts Per Billion
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
PREPA	Puerto Rico Power Electric Authority
SO <sub>2</sub> TAD	SO <sub>2</sub> NAAQS Designations Modeling Technical Assistance Document

## Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board

1-Hour SO<sub>2</sub> Designation Modeling Results

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## Introduction

This document presents the modeling results for the designation of the 2010 1-hour SO<sub>2</sub> NAAQS in Puerto Rico. In June 2010, the EPA promulgated the new 1-hour primary SO<sub>2</sub> NAAQS of 75 parts per billion (ppb), which is met at an ambient air quality monitoring site, when the 3-year average of the 99<sup>th</sup> percentile of 1-hour daily maximum concentrations does not exceed 75 ppb.

According to the 40 CFR Part 51, Data Requirements Rule (DRR)<sup>1</sup> for the 2010 1-hour SO<sub>2</sub> Primary NAAQS signed on August 10 2015, EPA is promulgating a rule directing state and tribal air agencies to provide data to characterize current air quality areas with large sources of SO<sub>2</sub> emissions (2,000 tons per year or more) to identify maximum 1-hour SO<sub>2</sub> concentrations in ambient air. The final rule set a process and timetable for agencies to either establish ambient monitoring sites or conduct air quality modeling and submit the air quality data to EPA.

On January 2016, EQB submitted EPA a list of the sources with SO<sub>2</sub> emissions over 2000 tons/yr. EQB determined three areas in Puerto Rico that have SO<sub>2</sub> sources with emissions over 2,000 tons/yr. The areas are San Juan, Guayama-Salinas and Guayanilla. The sources in San Juan area with SO<sub>2</sub> emissions over 2,000 tons/yr are PREPA San Juan and PREPA Palo Seco. In Guayama-Salinas area is PREPA Aguirre and in Guayanilla is PREPA Costa Sur.

EQB decided to characterize the air quality in the areas with SO<sub>2</sub> emissions sources over 2,000 tons/yr with dispersion modeling. The air quality model for the analysis is AERMOD, with three years of meteorological data and three years of actual SO<sub>2</sub> emissions, as recommended in the SO<sub>2</sub> NAAQS Designations Modeling Technical Assistance Document (SO2TAD)<sup>2</sup>. On July 2016, EQB submitted to EPA the Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Protocol<sup>3</sup> for its revision and approval. After that, EQB started the modeling process for the 1-hour SO<sub>2</sub> standard designation.

## Emission Inventory

The emission inventory used for the study was three years of SO<sub>2</sub> actual emissions data, from the years 2013 to 2015. EQB followed the recommendation in the SO2TAD of using the three most recent available years of SO<sub>2</sub> actual emissions. EQB used the SO<sub>2</sub> actual emissions certified data, submitted annually by PREPA.

This report is revised by the Inspection and Compliance Division of the Air Quality Area, to determine conformity with the air quality permit and regulations.

---

<sup>1</sup> Data Requirements Rule for 2010 1-Hour Sulfur Dioxide (SO<sub>2</sub>) Primary National Ambient Air Quality Standard (NAAQS). 40 CFR Part 51.

<sup>2</sup> SO<sub>2</sub> NAAQS Designations Modeling Technical Assistance Document, USEPA, August, 2016.

<sup>3</sup> Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Protocol. Environmental Quality Board. Air Quality Area, July, 2016.

## Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board

1-Hour SO<sub>2</sub> Designation Modeling Results

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The PREPA emission report presents the annual SO<sub>2</sub> actual emissions for the emission points of PREPA facility. For a complete information about the emission inventory, please refer to the modeling protocol document. A copy of the emission inventory table is in Appendix A.

## Background Concentration

For the 1-hour SO<sub>2</sub> background concentration, EQB used the less conservative “first tier” approach recommended in the SO2TAD of the 1-hour SO<sub>2</sub> background concentration based on the monitored design value for the most recent 3-year period, regardless of the years of meteorological data used in the modeling. EQB have SO<sub>2</sub> air quality monitors in the vicinity of San Juan area, but are source oriented, for that reason they are not representative of the nearby sources impacts.

EQB determined more adequate use a regional site monitor that is impacted by similar natural and distant man-made sources. EQB selected the data from the Guayama SO<sub>2</sub> monitor to be used as background concentration for San Juan area. This background concentration is from the years 2010-2012 and also will be used in Guayanilla and Salinas area. The concentration background is the most recent 3-year period design value for 1-hour SO<sub>2</sub> and the value is 58 µg/m<sup>3</sup> (22 ppb).

This background concentration will be used in Guayanilla because EQB does not have a SO<sub>2</sub> monitor in this municipality and the most representative air quality monitor for the area is the Guayama monitor. This background concentration is not source oriented and is impacted by similar natural and distant man-made sources. The concentration background data is in Appendix B.

## Model

The model used for the SO<sub>2</sub> designation modeling is AERMOD. This model is the preferred recommended by EPA for air quality modeling studies. The version used is the most recent or 15181. The default options will be selected for each run. The urban option will be used in San Juan because the facilities are in an urban environment.

The input data for PREPA emission points is for the EQB emission inventory and the SO<sub>2</sub> actual emissions is from the PREPA annual emission reports. The emission sources inside the facilities are point sources (boilers and gas turbines) and actual stack height data will be used. The parameters for each emission point source and their coordinates were from the information provided by the facilities in their construction permits.

## Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board

1-Hour SO<sub>2</sub> Designation Modeling Results

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The AERMOD model output options MAXDAILY, MAXDCONT and MXDYBYYR output options will be selected to calculate the model 1-hour SO<sub>2</sub> design value. Background concentration<sup>4</sup> will be added to the 1-hour SO<sub>2</sub> model design value for the comparison with the NAAQS.

## Meteorology

The SO<sub>2</sub>TAD recommends the most recent three years of meteorological data for the designation modeling, to allow the modeling to simulate a monitor. The SO<sub>2</sub>TAD also recommends that the meteorological data will be concurrent with the years of the actual SO<sub>2</sub> emissions used in the designation modeling. EQB will use three years of site-specific data, in the three areas of the designation modeling.

The three years of meteorological data are not concurrent with the three years of SO<sub>2</sub> actual emissions data, but EQB addressed this using the recommendation in the Section 7.4 Use of Older Meteorological Data<sup>5</sup> of the SO<sub>2</sub>TAD. The three years data periods were manually changed (change of the year on AERMET output files) as if these were the 2013 to 2015 data period.

The meteorology for the San Juan model is from the years 2007-2009, in Guayama-Salinas the meteorological data is from 2001-2003 and in Guayanilla is from 1991-1993. All this data was collected on-site. Full meteorological reports with the methodology used to process the data are available in the modeling protocol document<sup>6</sup>.

## Receptors

Two receptor grids were used in each run of the 1-hour SO<sub>2</sub> designation model. The receptor grids considered populated areas and places where it is feasible to place an air quality monitor. Discrete receptors across the facility fenceline were used in all modeling cases.

The first receptor grid is a 250 meters of space to determine the facility maximum impact radius. This is an exclusionary grid used to determine where is the SO<sub>2</sub> maximum impact. A refined grid of 50 meter of space was used in the area of maximum impact concentrations, to determine compliance with the 1- hour SO<sub>2</sub> NAAQS. Discrete receptors were placed at the facility fenceline in all modeling runs. For complete information about the receptor grids, please refer to the modeling protocol document.

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<sup>4</sup> See Air Quality Monitoring Design Value Report in Appendix B.

<sup>5</sup> Section 7.4: Use of Older Meteorological Data. SO<sub>2</sub> NAAQS Designations Modeling Technical Assistance Document, USEPA. August, 2016.

<sup>6</sup> Puerto Rico 1-Hour SO<sub>2</sub> Designation Modeling Protocol. Environmental Quality Board. Air Quality Area. July, 2016.

## Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board

1-Hour SO<sub>2</sub> Designation Modeling Results

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## Model Results

The model results for the four emission sources in the modeling study are presented below. The 1-hour SO<sub>2</sub> NAAQS is represented by the model design value, which is calculated using the three years average of the 4<sup>th</sup> highest of the daily maximum. EQB used the following methodology to determine the SO<sub>2</sub> design value for each emission source in the study.

Separate modeling runs for each facility by year of meteorological and actual emissions data were performed to determine the SO<sub>2</sub> 4<sup>th</sup> highest of the daily maximum by year. The modeling runs for each facility have the same receptor network and emission point parameters data, the only data that changes in each run is the SO<sub>2</sub> actual emissions and the concurrent meteorological data.

For each modeling run, the 4<sup>th</sup> highest value was determined using the MAXDAILY file. The SO<sub>2</sub> design value for each facility in the study is the three years average of the 4<sup>th</sup> highest. The SO<sub>2</sub> background concentration was added to this design value.

EQB used separate model runs because the receptor networks are extensive and this complicate the evaluation of the output files. The MAXDCONT file was used to determine the contribution of each facility emission point to the design value. Modeling runs output files are in the Appendix C and electronic copies of the MAXDAILY, MAXDCONT and MXDYBYYR files will be provided. The SO<sub>2</sub> designation modeling results are presented below.

#### A. PREPA San Juan

The model results for PREPA San Juan are presented in the next tables. The 1-hour SO<sub>2</sub> design value is above the NAAQS of 75 ppb or 196 µg/m<sup>3</sup>. The maximum results impact area is approximately 3.6 km radius. The 4<sup>th</sup> highest for each modeling run, plus the background concentration and the SO<sub>2</sub> design value for PREPA San Juan are presented in Table 1. The Table 2 presents the modeling results by emission point or MAXDCONT output file data.

Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board  
1-Hour SO<sub>2</sub> Designation Modeling Results

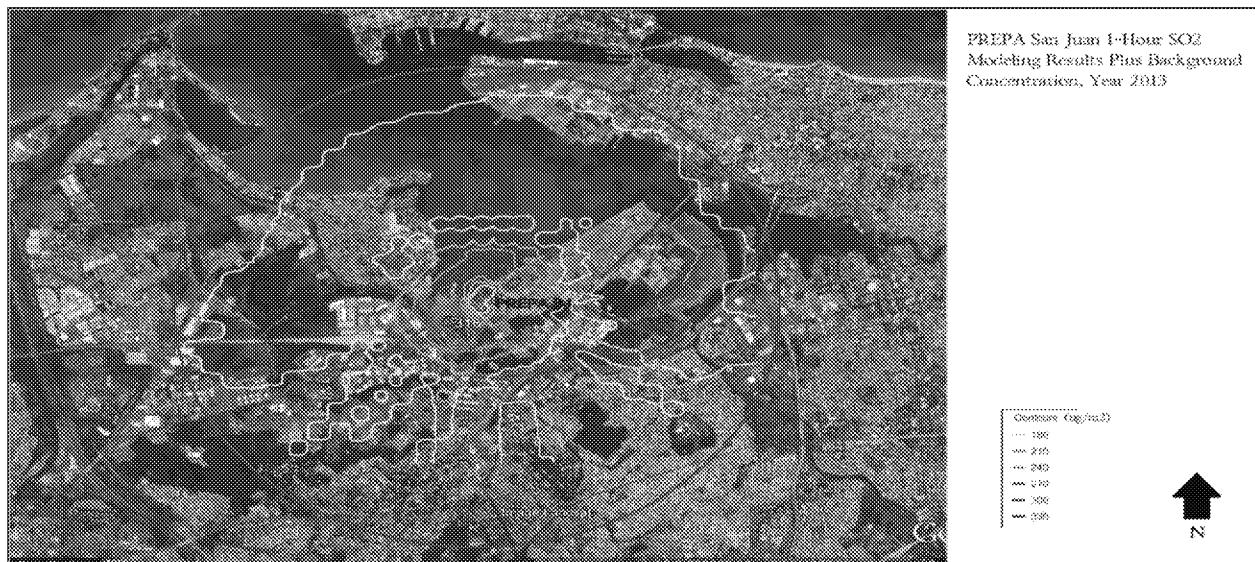
Table 1: PREPA San Juan 1-Hour SO<sub>2</sub> Modeling Results

Year	Coordinates (m)		SO <sub>2</sub> Concentrations µg/m <sup>3</sup>			
	East	North	4 <sup>th</sup> Highest Model Result	Background Concentration	Total Concentration	1-Hour SO <sub>2</sub> Design Value
2013	805450	2039622	258	58	316	343
2014	805550	2038922	267		325	
2015	805550	2038922	329		387	

Table 2: PREPA San Juan 1-Hour SO<sub>2</sub> Modeling Results by Emission Point

Year	4 <sup>th</sup> Highest SO <sub>2</sub> Model Concentrations µg/m <sup>3</sup>						
	SJ5/6	Boiler7	Boiler8	Boiler 9	Boiler10	Background Concentration	Total Concentration
2013	0.89787	64.81184	52.32642	66.97350	72.74486	58	315.75449
2014	0.21331	88.40702	108.53339	53.99018	15.75475		324.89865
2015	0.33223	99.65805	82.97753	144.13036	2.33466		387.43283

The modeling scenario with the highest SO<sub>2</sub> concentrations was 2015 and therefore have the maximum impact area with a radius of 4.1 km. The maximum impact area for 2013 and 2014 was approximately 3.4 km radius. The Figures 1-3 showed the modeling results isopleths and the 1-hour SO<sub>2</sub> 4<sup>th</sup> highest concentration by year of data.

Figure 1: PREPA San Juan 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2013

Commonwealth of Puerto Rico\Puerto Rico Environmental Quality Board  
1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 2: PREPA San Juan 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2014

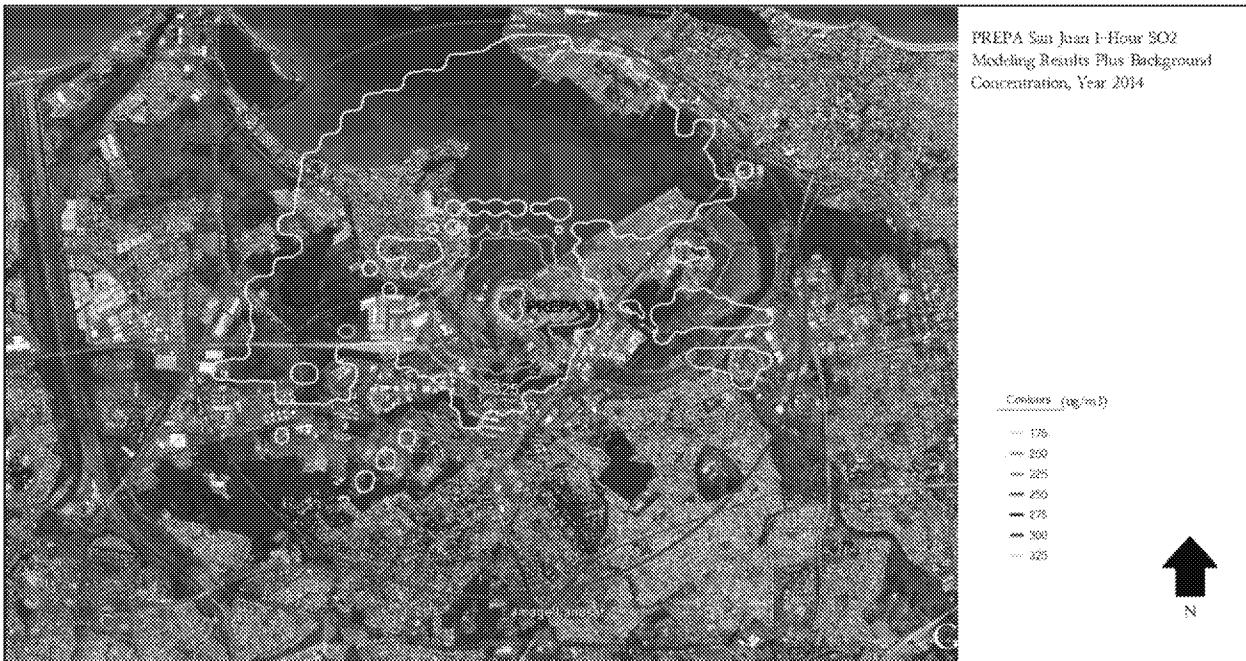
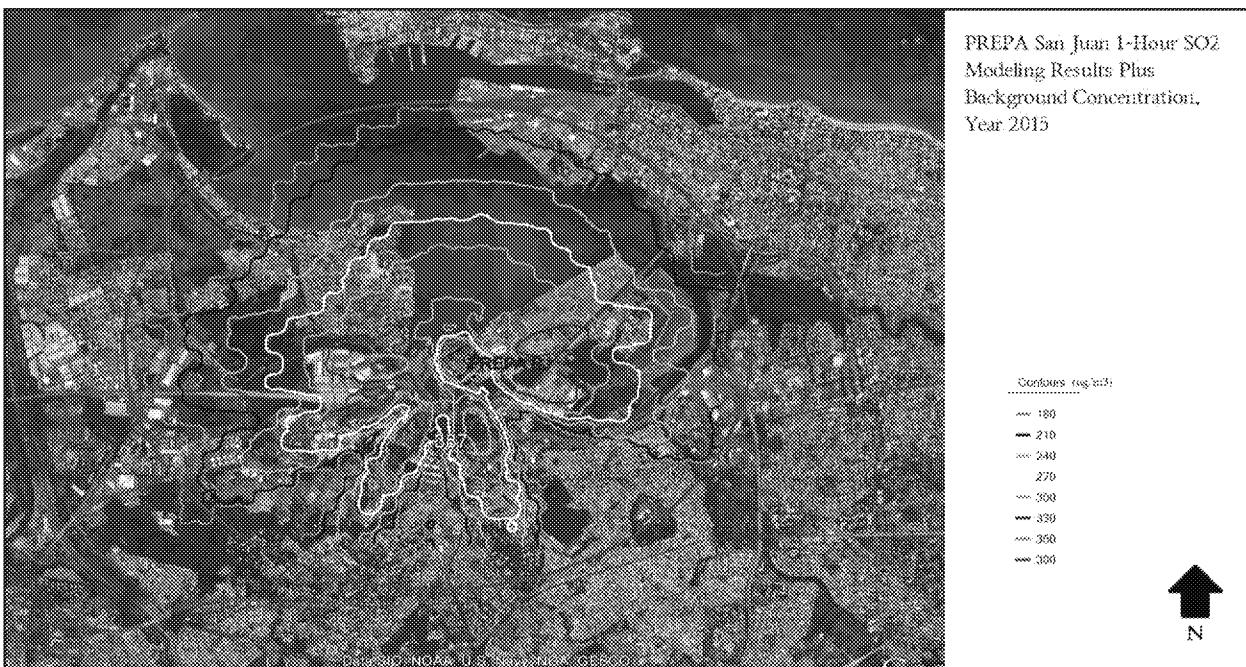


Figure 3: PREPA San Juan 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2015



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1-Hour SO<sub>2</sub> Designation Modeling Results

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B. PREPA Palo Seco

The model results for PREPA Palo Seco are presented in the following tables. The 1-hour SO<sub>2</sub> design value is above the NAAQS of 75 ppb or 196 µg/m<sup>3</sup>. The maximum results impact area is approximately 2.7 km radius. The 4<sup>th</sup> highest for each modeling run, plus the background concentration and the 1-hour SO<sub>2</sub> design value for PREPA San Juan are presented in Table 3. The Table 4 presents the modeling results by emission point or the MAXDCONT output file data.

Table 3: PREPA Palo Seco 1-Hour SO<sub>2</sub> Modeling Results

Year	Coordinates (m)		SO <sub>2</sub> Concentrations µg/m <sup>3</sup>				1-Hour SO <sub>2</sub> Design Value
	East	North	4 <sup>th</sup> Highest Model Result	Background Concentration	Total Concentration		
2013	800700	2043072	205	58	263	207	207
2014	800700	2043072	114		172		
2015	801550	2042022	127		185		

The SO<sub>2</sub> modeling results for 2013 data are over de 1-hour SO<sub>2</sub> NAAQS, the other years are below the standard. The three years average of the 4<sup>th</sup> highest is above the 1-hour SO<sub>2</sub> NAAQS. The next table presents the modeling results by the emission points of PREPA Palo Seco.

Table 4: PREPA Palo Seco 1-Hour SO<sub>2</sub> Modeling Results by Emission Point

Year	4 <sup>th</sup> Highest SO <sub>2</sub> Model Concentrations µg/m <sup>3</sup>								Background Concentration	Total Concentration
	PS1	PS2	PS3	PS4	GT1	GT2	GT3			
2013	38.50191	32.42061	29.33763	104.71084	0.00286	0.00532	0.00407	58	262.98324	172.0224
2014	30.88408	34.61644	0.000	48.33751	0.03621	0.07657	0.07159		185.0481	
2015	43.25716	47.47828	27.54117	8.59734	0.00056	0.09414	0.07945			

The modeling results for year 2013 were the highest and the maximum impact area have approximately 2.7 km radius. The modeling results for 2014 and 2015 were below the 1-hour SO<sub>2</sub> NAAQS. Figures 4-6 showed the modeling results isopleths and the 1-hour SO<sub>2</sub> 4<sup>th</sup> highest concentration by year of data.

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1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 4: PREPA Palo Seco 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2013



Figure 5: PREPA Palo Seco 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2014



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1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 6: PREPA Palo Seco 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2015



### C. PREPA Aguirre

The following tables presents the model results for PREPA Aguirre. The 1-hour SO<sub>2</sub> design value is above the NAAQS of 75 ppb or 196 µg/m<sup>3</sup>. The 4<sup>th</sup> highest for each modeling run, plus the background concentration and the SO<sub>2</sub> design value for PREPA Aguirre are presented in Table 5. The Table 6 presents the modeling results by emission point or MAXDCONT output file data.

Table 5: PREPA Aguirre 1-Hour SO<sub>2</sub> Modeling Results

Year	Coordinates (m)		SO <sub>2</sub> Concentrations µg/m <sup>3</sup>			
	East	North	4 <sup>th</sup> Highest Model Result	Background Concentration	Total Concentration	1-Hour SO <sub>2</sub> Design Value
2013	792100	1988250	178	58	236	232
2014	790750	1988000	168		226	
2015	791500	1986500	175		233	

The SO<sub>2</sub> modeling results for PREPA Aguirre are over de 1-hour SO<sub>2</sub> NAAQS. The three years average of the 4<sup>th</sup> highest is 232 µg/m<sup>3</sup> and is above the 1-hour SO<sub>2</sub> NAAQS. The next table presents the modeling results by each emission point of PREPA Aguirre.

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1-Hour SO<sub>2</sub> Designation Modeling Results

Table 6: PREPA Aguirre 1-Hour SO<sub>2</sub> Modeling Results by Emission Point

Year	4 <sup>th</sup> Highest SO <sub>2</sub> Model Concentrations µg/m <sup>3</sup>						
	AG1	AG2	CC1	CC2	AGGT	Background Concentration	Total Concentration
2013	92.42972	85.24826	0.08780	0.21629	0.00038	58	235.98245
2014	60.94587	106.07054	0.25548	0.35438	0.00489		225.63116
2015	81.81814	91.93863	0.76722	0.49448	0.02302		233.04149

The modeling results for year 2013 were the highest and the maximum impact area extends approximately 5.4 km from the source. The modeling results for 2014 and 2015 were also above the 1-hour SO<sub>2</sub> NAAQS and the maximum impact areas extends from the source, 5 and 4.7 km, respectively. Figures 7-9 showed the modeling results isopleths and the 1-hour SO<sub>2</sub> 4<sup>th</sup> highest concentration by year of data.

Figure 7: PREPA Aguirre 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2013



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1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 8: PREPA Aguirre 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2014

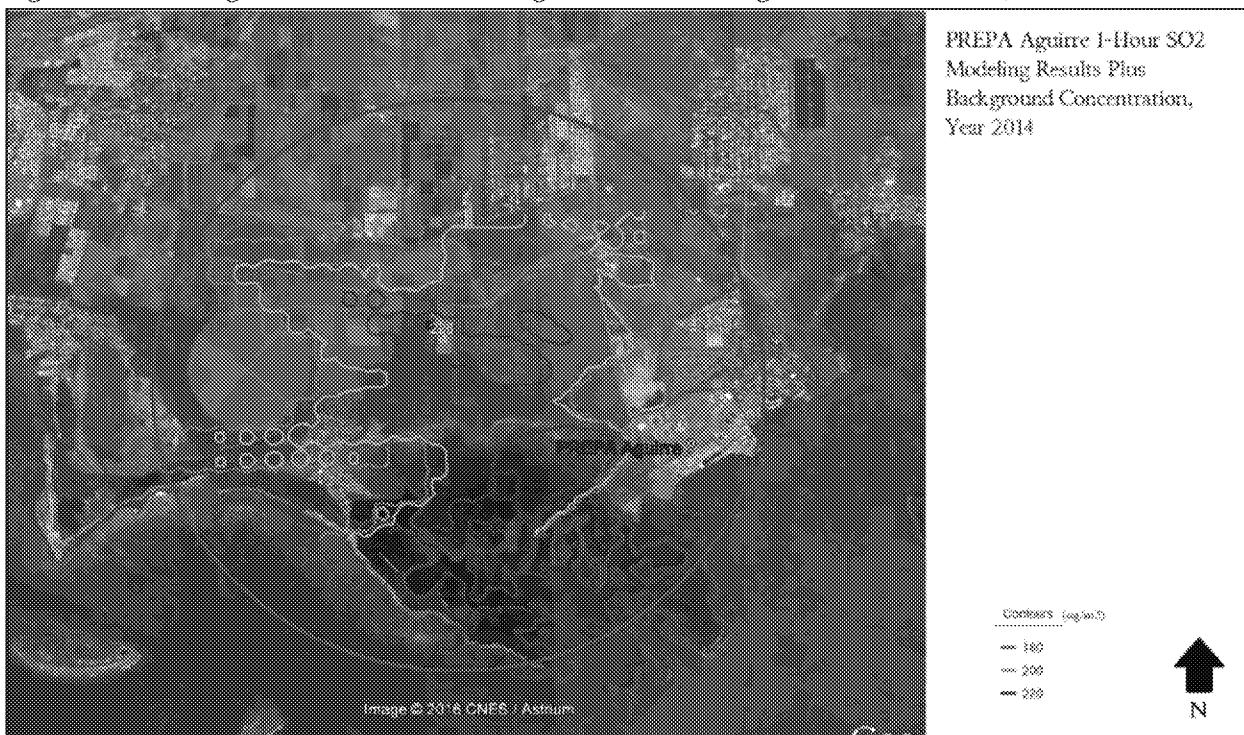


Figure 9: PREPA Aguirre 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2015



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1-Hour SO<sub>2</sub> Designation Modeling Results

D. PREPA Costa Sur

The following tables presents the model results for PREPA Costa Sur. The 1-hour SO<sub>2</sub> design value is above the NAAQS of 75 ppb or 196 µg/m<sup>3</sup>. The 4<sup>th</sup> highest for each modeling run, plus the background concentration and the SO<sub>2</sub> design value for PREPA Costa Sur are presented in Table 7. The Table 8 presents the modeling results by emission point or MAXDCONT output file data.

Table 7: PREPA Costa Sur 1-Hour SO<sub>2</sub> Modeling Results

Year	Coordinates (m)		SO <sub>2</sub> Concentrations µg/m <sup>3</sup>			
	East	North	4 <sup>th</sup> Highest Model Result	Background Concentration	Total Concentration	1-Hour SO <sub>2</sub> Design Value
2013	738250	1994900	945	58	1003	1046
2014	735250	1994800	979		1037	
2015	737400	1995750	1040		1098	

The SO<sub>2</sub> modeling results for PREPA Costa Sur are over de 1-hour SO<sub>2</sub> NAAQS. The three years average of the 4<sup>th</sup> highest is 1046 µg/m<sup>3</sup> and is above the 1-hour SO<sub>2</sub> NAAQS. The next table presents the modeling results by emission point of PREPA Costa Sur.

Table 8: PREPA Costa Sur 1-Hour SO<sub>2</sub> Modeling Results by Emission Point

Year	4 <sup>th</sup> Highest SO <sub>2</sub> Model Concentrations µg/m <sup>3</sup>						
	SC3	SC4	SC5	SC6	PB1	Background Concentration	Total Concentration
2013	3.74367	0.99801	303.53343	636.15715	0.10537	58	1002.53763
2014	0.0	0.0	515.76028	463.07010	0.00757		1036.83795
2015	17.03536	1.70005	511.64441	509.33306	0.00074		1097.71362

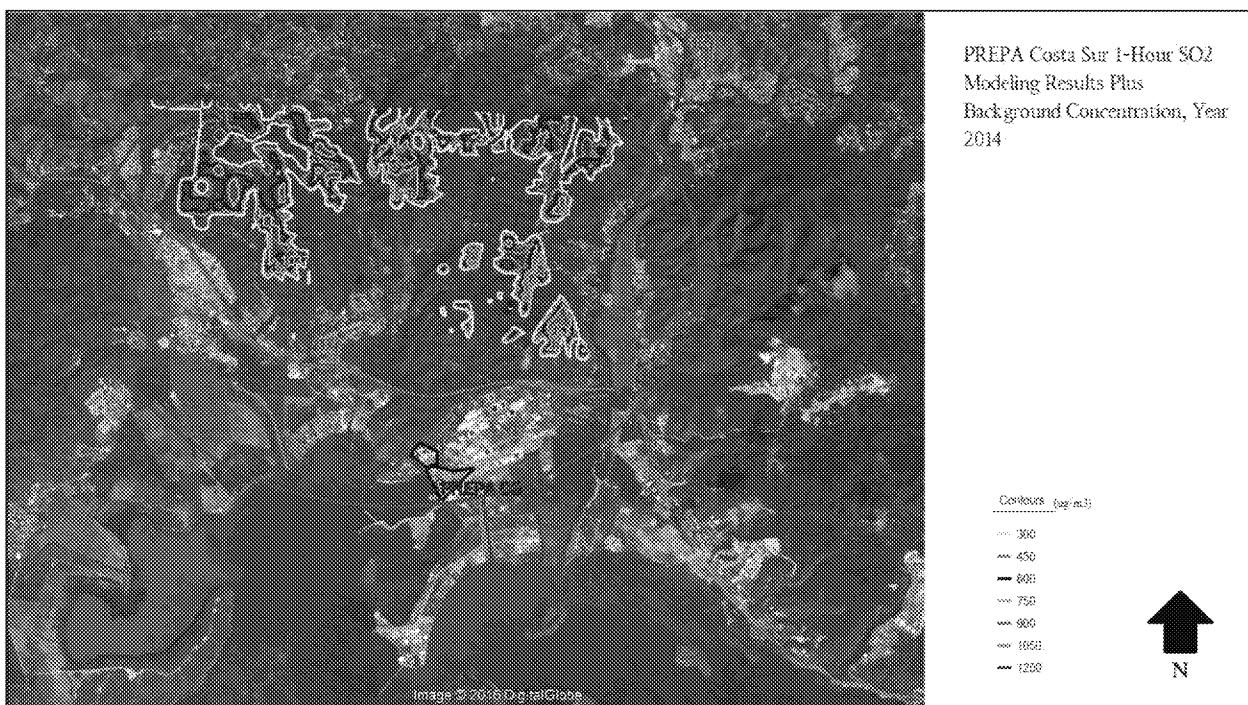
The modeling results for year 2015 were the highest and the maximum impact area extends approximately 7 km from the source. The modeling results for 2014 and 2015 were also above the 1-hour SO<sub>2</sub> NAAQS and the maximum impact areas extension from the source were also 7 km. Figures 10-12 showed the modeling results isopleths and the 1-hour SO<sub>2</sub> 4<sup>th</sup> highest concentration by year of data.

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1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 10: PREPA Costa Sur 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2013



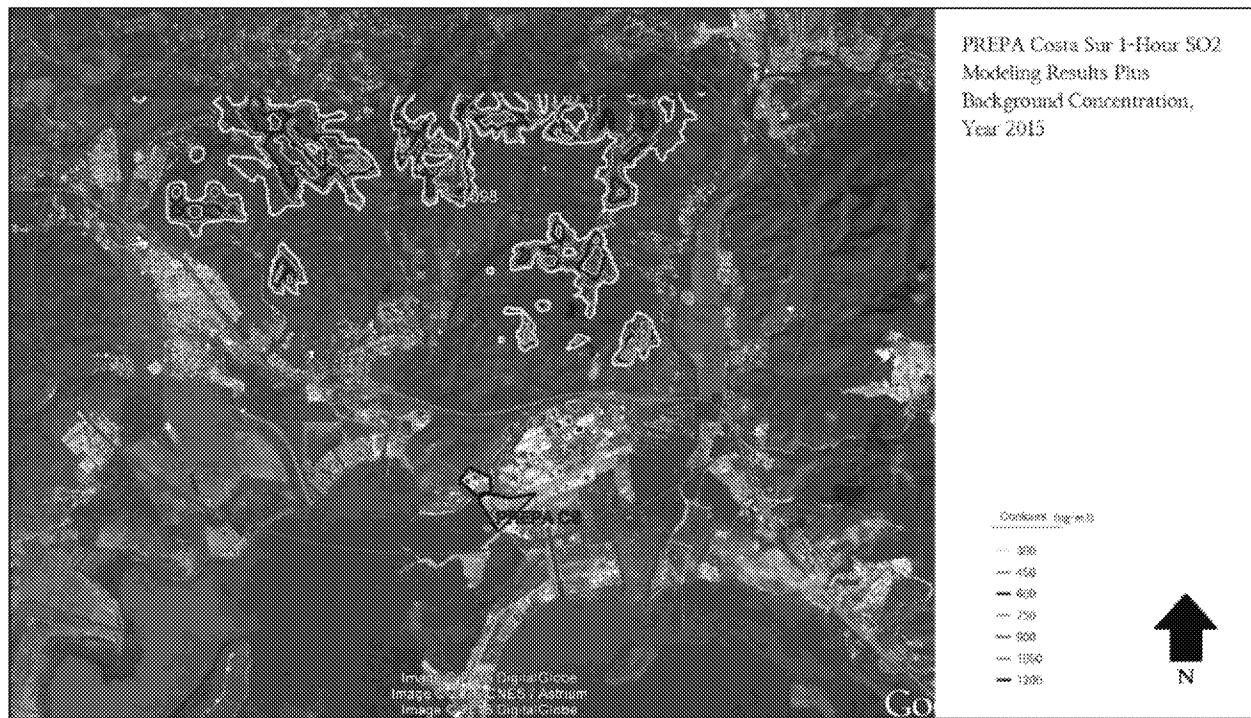
Figure 11: PREPA Costa Sur 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2014



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1-Hour SO<sub>2</sub> Designation Modeling Results

Figure 12: PREPA Costa Sur 1-Hour SO<sub>2</sub> Modeling Results Plus Background Concentration, Year 2015



### Conclusion

According to the modeling results, the SO<sub>2</sub> emissions of the four facilities in the study do not comply with the 1-hour SO<sub>2</sub> NAAQS of 196  $\mu\text{g}/\text{m}^3$ . The facility with the highest results was PREPA Costa Sur in Guayanilla, with the 1-hour SO<sub>2</sub> design value of 1046  $\mu\text{g}/\text{m}^3$ . The facility with the lowest results was PREPA Palo Seco in San Juan area, with the 1-hour SO<sub>2</sub> design value of 207  $\mu\text{g}/\text{m}^3$ . The model concentration results in all the areas under the study are above the 1-hour SO<sub>2</sub> NAAQS of 196  $\mu\text{g}/\text{m}^3$ .

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1-Hour SO<sub>2</sub> Designation Modeling Results

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I. APPENDIX A: Emission Inventory for the 1-Hour SO<sub>2</sub> Designation Model

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1-Hour SO<sub>2</sub> Designation Modeling ResultsEmission Inventory for the 1-Hour SO<sub>2</sub> Designation Model

PUERTO RICO SO <sub>2</sub> DESIGNATION EMISSION INVENTORY													
PREPA San Juan													
Emission Unit	Address/Physical/Postal	Municipality	SCC	Model Point ID	UTM	Control Equipment	Control Efficiency %	Actual Emissions (ton/yr)	Stack Height (m)	Stack Diameter (m)	Stack Velocity (m/s)	Stack Temperature (K)	
PREPS-San Juan	Mercedo Canal Ave. Zone Cesar Aves. 22-32, San Juan, PR 00901-367	San Juan	131-08-44	ROTTER	285981	284915	93.6	43.6	5.5	1.8	28.028	408.15	
Boiler 7			131-08-44	ROTTER	285981	284916	93.6	43.6	5.5	1.8	28.028	408.15	
Boiler 8			131-08-44	ROTTER	285981	284915	93.6	43.6	5.5	1.8	28.028	408.15	
Boiler 9			131-08-44	ROTTER	285981	284915	93.6	43.6	5.5	1.8	28.028	408.15	
Boiler 10			131-08-44	ROTTER	285981	284915	93.6	43.6	5.5	1.8	28.028	408.15	
PREPA Pub Seco						Total	5397.65	5135.78	6503.91				
PREPA Aguirre													
Emission Unit	Address/Physical/Postal	Municipality	SCC	Model Point ID	UTM	Control Equipment	Control Efficiency %	Actual Emissions (ton/yr)	Stack Height (m)	Stack Diameter (m)	Stack Velocity (m/s)	Stack Temperature (K)	
Pub Seco 1			131-08-44	PSI	281154	281154	103.96	30.45	5.5	2.5	27.45	436	
Pub Seco 2			131-08-44	PSI	281155	281155	85.16	33.15	11.5	2.5	27.46	436	
Pub Seco 3	Rod 165, Km 3.8, Tia Pao PO Box 3426, San Juan, PR 00936	San Juan	131-08-44	PSI	281156	281156	81.26	30.00	6.3	2.4	26.6	426	
Pub Seco 4			131-08-44	PSI	281156	281156	81.26	30.00	6.3	2.4	26.6	426	
Power Block 1			131-08-44	PSI	281157	281157	3.19	1.95	0.03	1.2	2.9	436	
Power Block 2			131-08-44	PSI	281158	281158	0.38	4.32	1.2	2.9	19.13	733	
Power Block 3			131-08-44	PSI	281159	281159	0.31	4.46	1.03	1.2	19.13	733	
Power Block 4			131-08-44	PSI	281160	281160	Total	570.68	3128.02	2979.26			
PREPA Costa Sur													
Emission Unit	Address/Physical/Postal	Municipality	SCC	Model Point ID	UTM	Control Equipment	Control Efficiency %	Actual Emissions (ton/yr)	Stack Height (m)	Stack Diameter (m)	Stack Velocity (m/s)	Stack Temperature (K)	
Boiler AG1			131-08-34	AG1	739212	187108	499.1	35.3	47.9	2.5	38.6	422	
Boiler AG2			131-08-34	AG2	739213	187108	462.3	36.65	50.3	2.5	38.6	422	
Gas Turbines	Red 18, Km 15.1 Saban PO Box 3427, San Juan, PR 00936-4267	Sabana	281-00-31	CC1	286905	n/a	6.41	15.5	50.5	17.3	24	69.3	
Gas Turbines			281-00-31	CC1	286906	286906	19.51	26.1	55.4	17.3	24	69.3	
CC21 to CC4			281-00-31	CC2	286907	286907	6.71	6.34	12.1	2.9	40.9	777	
AGT21 to 24			281-00-31	AGT	286908	286908	Total	946.931	9261.54	9585.22			

**Deficiencias en el análisis de los impactos geológicos encontrados en la Declaración de Impacto Ambiental del proyecto “Montalva Solar Farm – Guánica – Lajas” (Borrador – DIA)**

**Preparado por el Dr. José Molinelli Freytes, geomorfólogo**

El propósito de este escrito es presentar la opinión pericial del Dr. José Molinelli Freytes en torno a las serias deficiencias que presenta el análisis geológico del “Borrador de la Declaración de Impacto Ambiental – Montalva Solar Farm – Guánica – Lajas”.

Uno de los elementos fundamentales que debe incluir una DIA es la evaluación detallada de los impactos que tendrán las acciones propuestas en el ambiente natural y antropogénico así como el impacto de dichos ambientes en el proyecto mismo. La evaluación debe considerar éstos impactos recíprocos a corto, mediano y largo plazo.

Primeramente se presentarán las deficiencias, en la información geológica, que contiene la DIA, y se enfatiza el que solo se presenta información muy limitada y de carácter descriptivo. Tampoco considera las implicaciones que pueda tener dicha geología en el proyecto. Luego se consideran las deficiencias que presenta el mapa geológico, que al excluir la geología que circunda el proyecto, lo considera como un sistema aislado que no interactúa con el ambiente geológico aledaño.

En segundo término se aborda la ausencia total de un análisis comprensivo de los peligros geológicos inducidos por terremoto en el área propuesta. A pesar de que el proyecto propuesto está en el margen, tectónicamente activo, de la micro-placa en que está Puerto Rico, no se hace mención alguna del peligro sísmico y el riesgo significativo que presenta para el proyecto. Se establecen las bases para demostrar la necesidad crítica de evaluar el riesgo sísmico identificando las principales zonas sismogénicas en la región de Puerto Rico, las fallas activas que discurren por la zona del proyecto y el incremento en el riesgo sísmico como consecuencia de los eventos que han estado ocurriendo en el suroeste de Puerto Rico desde diciembre de 2019.

**Deficiencias en la información geológica que presenta la DIA.**

Con respecto a las deficiencias en la información geológica cabe destacar el que no se presentan, discuten, o analizan los impactos del proyecto en el ambiente geológico ni el impacto de los procesos geológicos, que a pesar de iniciarse fuera de los límites físicos del proyecto, pueden impactarlo significativamente.

Estos incluyen la erosión acelerada, las escorrentías, los movimientos de masa incluyendo flujos de tierra, deslizamientos y despeños así como la actividad sísmica y los peligros geológicos inducidos por terremotos.

Para comenzar, en la DIA se incluyen solo dos páginas, la 31 y 32, con información meramente descriptiva, con segmentos mal traducidos del idioma inglés, proveniente de los mapas geológicos del USGS. Esta traducción hace incomprendibles segmentos completos de la narrativa descriptiva de la geología del proyecto.

Se trata la geología como si el área del proyecto fuera un sistema aislado del resto del ambiente. Presenta un mapa geológico que solamente muestra la geología del área específica de las fincas en que estará enclavado el proyecto. Esto impide examinar como los cambios en la continuidad geológica pueden impactar el proyecto así como evaluar sus consecuencias e impactos en el sentido más amplio.

Especificamente impide comprender y analizar cartográficamente el contexto geológico del proyecto y evaluar el impacto, que las áreas aledañas a las fincas puedan tener en el proyecto propuesto. Por ejemplo, puede haber procesos geológicos que se originen fuera del área del proyecto que impacten significativamente el mismo. Este sería el caso de movimientos de masa incluyendo despeños, flujos detriticos, flujos de tierra y deslizamientos de diverso tipo además de erosión acelerada, cambios hidrológicos y otros que pueden originarse fuera del proyecto pero que pueden impactarlo.

Una de las deficiencias mayores es la ausencia crasa de un análisis de las consecuencias que puede tener la geología y los procesos geológicos en el proyecto. Una DIA debe analizar las implicaciones de la geología que se describe en los mapas geológicos en el contexto del proyecto que en este caso es de la Finca Solar de Montalva. Por ejemplo, a continuación se presentan las descripciones de las cuatro formaciones y/o depósitos geológicos identificados dentro del proyecto según aparecen en las páginas 31 y 32.

*"Las siguientes formaciones geológicas están presentes en el predio (véase Figura 7.)"  
"Formaciones Geológicas): Kpa, Caliza Parquera: De edad cretáceo superior, consiste en caliza, volcánica y volcanoclásticas relacionadas."*

El limitarse a copiar información de los mapas geológicos de forma muy resumida, sin interpretarla, en cuanto a lo que significa dentro del contexto del proyecto de la Finca Solar, no contribuye al logro de los objetivos y metas de la DIA. ¿Qué significa en términos del proyecto la presencia de la "caliza Parguera y el que esté relacionada a rocas volcánicas y volcanoclásticas? ¿Presenta rasgos de la topografía cárstica? ¿Hay depresiones cerradas que afecten el drenaje y la dirección de las escorrentías pluviales?

*"Kpob, Basalto Olivino: Flujos gruesos de lava masiva acolchonada de color oscuro-verdoso- grisácea que contienen plagioclasa, clinopiroxeno y ontapiroxeno."*

¿Qué significa en términos del proyecto la presencia de "almohadillas lávicas basálticas (incorrectamente traducidas como "acolchonadas") con las mineralizaciones indicadas? ¿Puede presentar limitaciones para las

**excavaciones o cimentaciones? ¿Cuán meteorizada están y cuáles son sus implicaciones dentro del proyecto?**

*“Qa, Aluvión, Depósitos Cuaternarios: Valle de relleno y depósitos de flujos en masa relacionados con los episodios de precipitación intensa. Arenas poco consolidadas y sedimentos asociados a los sistemas de drenaje activos y pendientes de las colinas.”*

**El aluvión Cuaternario ocupa la mayor parte del proyecto. ¿Qué implicaciones tiene para el proyecto de placas solares el que se ubique en un “valle de relleno” que al presente está recibiendo sedimentos de las áreas colindantes? ¿Cuál ha sido la magnitud y frecuencia de estos eventos considerando las lluvias más intensas y la precipitación máxima probable durante la vida útil del proyecto? ¿Qué implicaciones tienen los “sistemas de drenaje activos” que desaguan directamente en el área del proyecto? ¿Por qué no se incluyeron en el mapa geológico las áreas colindantes al proyecto si tienen un efecto directo en él? ¿A qué profundidad está el nivel freático en los terrenos aluviales, cuánto fluctúa durante el año hidrológico, cuáles son sus niveles máximos y mínimos y qué implicaciones tiene para el proyecto? ¿Cuál es el espesor o grosor del depósito aluvial y cuál es su potencial de amplificación de ondas sísmicas? ¿Hay lentes de arena con potencial de llicuación?**

*“Tjd, Formación Juana Díaz: Se compone de arenisca conglomerática, conglomerados, arenita lítica calcárea y caliza en menor proporción; de estratos medianos a maciza con un espesor mayor a los 300 metros. La mayor parte del área del proyecto está compuesta por la formación geológica Qa.”*

**¿Qué significa en términos del proyecto la presencia de la “Formación Juana Diaz” y el que consista de arenisca, conglomerados y caliza? ¿Presenta rasgos de la topografía cárstica con cavidades por disolución? ¿Hay depresiones cerradas que afecten el drenaje y la dirección de las escorrentías pluviales?**

Estás son solo algunas de las consideraciones geológicas que debieron ser analizadas en la DIA en lugar de meramente copiar y pegar la información de una mapa geológico sin sentido analítico alguno por lo que no cumple con el propósito esencial de una DIA. En otras palabras una DIA es un instrumento de análisis del impacto ambiental de un proyecto y del ambiente en el proyecto y no la recopilación de información que no se analiza dentro del contexto del proyecto.

#### **Consideraciones en torno al peligro de terremoto en el área del proyecto.**

Es inaudito que el borrador de la DIA del proyecto “Montalva Solar Farm – Guánica – Lajas” que conlleva una inversión ascendente a unos 250 millones de dólares no consideré el peligro sísmico que amenaza a dicho proyecto ni su impacto en el área que dependerá de la energía que éste produzca.

A continuación se expondrá la importancia de analizar el contexto sísmico, los peligros geológicos inducidos por terremoto que pueden impactar al proyecto y los asuntos que deben ser considerados, analizados y discutidos en la DIA incluyendo las serias limitaciones que presenta dicha amenaza en la ubicación propuesta para dicho proyecto.

A nivel macro, Puerto Rico y las Islas Vírgenes constituyen un bloque tectónico complejo que actúa como una micro-placa que yace entre la placa del Caribe y la placa de América del Norte. Esta se mueve esencialmente hacia el este a una razón promedio de dos centímetros al año.

Mientras tanto la placa de América del Norte se mueve hacia el oeste rozándose con la microplaca de PR y las Islas Vírgenes. Dicho margen está dominado por procesos de subducción oblicua, a medida que va adentrándose hacia el manto terrestre a lo largo del sistema de la trinchera de Puerto Rico. La convergencia de dicha placa bajo Puerto Rico alcanza uno 160 kilómetros de profundidad y es la causante de sismos de foco llano e intermedio en la región de Puerto Rico.

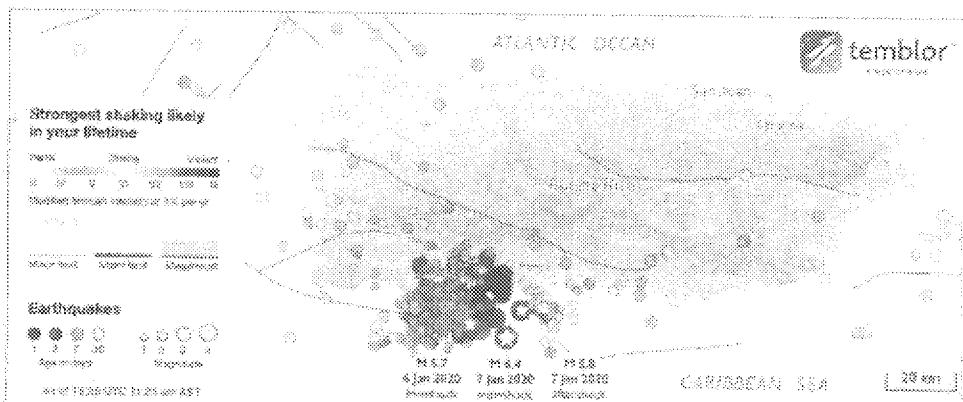
En esta zona sismogénica ocurrió el sismo de 2 de mayo de 1787 que pudo haber alcanzado una magnitud de unos 8 grados en la escala Richter siendo dicho evento el de mayor magnitud que se ha documentado en la historia de Puerto Rico. Afectó fuertemente la porción septentrional de Puerto Rico quebrando porciones de las murallas del Castillo San Felipe del Morro y San Cristóbal. En la región sur también se sintió muy fuerte afectando la iglesia de la Guadalupe en Ponce.

Al oeste de Puerto Rico, un sistema de fallas discurre hacia el sur de la trinchera pasando por el Cañón de la Mona. Éste constituye una fosa tectónica, producto de fuerzas tensionales creada por el movimiento diferencial entre las placas. Dicho movimiento crea un efecto rotacional, "en contra de las manecillas del reloj", en la microplaca de Puerto Rico y las Islas Vírgenes. Fue en el Cañón de la Mona el epicentro del terremoto de San Fermín el 11 de octubre de 1918 que tuvo una magnitud aproximada de 7.3 grados. Vino acompañado de un tsunami que causó la muerte a más de 40 personas y se sintió muy fuerte en la región oeste incluyendo el área de Lajas y Guánica donde se sintieron intensidades de VII en la es la Rossi-Forel.

Especificamente la región suroeste ha estado muy activa desde hace décadas. En el 1987 un sismo de 4.8 grados quebró las columnas cortas de la Escuela Superior de Boquerón que acababa de ser construida al igual que la Segunda Unidad Llanos Tuna del mismo área. Numerosas viviendas sufrieron daños estructurales en paredes y columnas. La actividad sísmica con foco muy cerca de la superficie estuvo asociada a la falla de Boquerón que discurre por el sur del Valle de Lajas y que está asociada al sistema de la falla de Punta Montalva en Guánica donde ha ocurrido una porción significativa de la actividad sísmica que sigue impactando el área desde fines de diciembre de 2019.

Miles de sismos han ocurrido en los municipios costeros desde Cabo Rojo hasta Juana Díaz desde fines de diciembre de 2019. El área del proyecto entre Guánica y Lajas fueron impactadas significativamente. Los eventos sísmicos más significativos ocurrieron el 29 de diciembre con magnitud de 5.0, el de 5.7 del día de Reyes que causó el colapso de numerosas casas construidas sobre columnas particularmente en el área de Guánica y el de la madrugada del 7 de enero que alcanzó una magnitud de 6.4 y que vino acompañado de una réplica de 5.8.

El siguiente mapa proveniente del escrito titulado “La secuencia sísmica del invierno de 2019 -2020 en PR que ha mantenido a la población en alerta” preparado por A.M. López, K.S.Hughes y E. Vanacore fue publicado en el portal “temblor”. Muestra la ubicación de los principales sismos que han ocurridos a principios del año en curso.

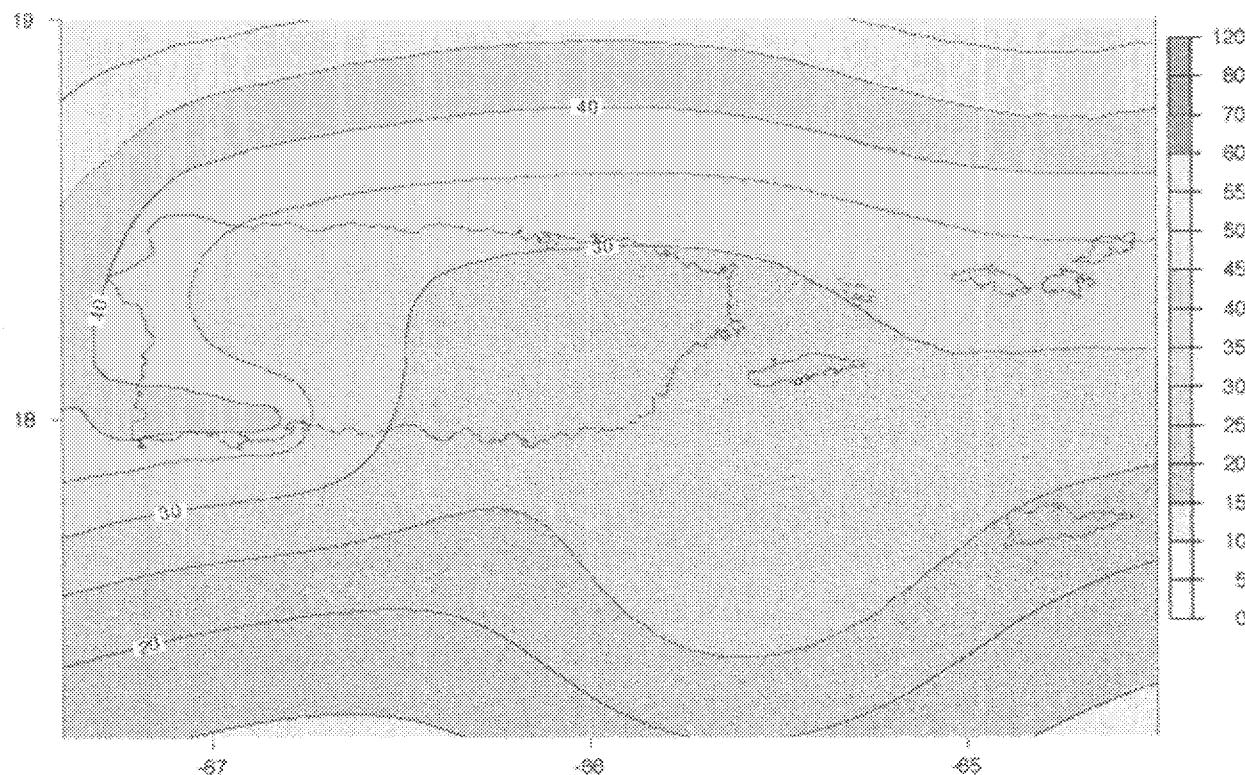


Éste muestra claramente la intensa actividad sísmica en el área del proyecto propuesto. Ésta se mantiene activa en el área y se proyecta que se mantenga por varias décadas. Como consecuencia del sismo de 6.4 hubo desplazamientos verticales y laterales a través de la región suroeste. Se estima que el área de máximo desplazamiento vertical negativo ocurrió en un punto al sur de la Bahía de Guayanilla donde se estimó un hundimiento de unas 7 pulgadas. La intensidad sísmica en el área alcanzó VIII en la escala MMI.

Otra zona de potencial sismogénico es la Fosa de Muertos, al sur de Puerto Rico, que al presente no ha mostrado actividad significativa pero que podría generar un sismo fuerte, si estuviera almacenando energía elástica, como consecuencia de la interacción entre la Placa del Caribe y la micro-placa de Puerto Rico y las Islas Vírgenes.

Hay que mencionar la presencia las fallas en tierra que forman parte del sistema meridional de fallas que discurre desde Aguirre cruzando diagonalmente a través del interior montañoso central hasta salir por Rincón. Este sistema ha mostrado enjambres sísmicos en el pasado y no se puede descartar la posibilidad de un evento significativo. De manera similar, pero con potencial sísmico más bajo, es el sistema septentrional de fallas que se extiende desde el norte de Humacao hasta un área al sur del carso donde se oculta bajo las calizas de edad Terciaria que yacen sobre esta.

Otra estructura sismogénica que resulta de las fuerzas tensionales entre las placas que interactúan en la región de Puerto Rico y las islas Vírgenes es la Fosa de Anegrada ubicada al sudeste de Vieques y el noroeste de la isla de Santa Cruz. Aquí se produjo el sismo de las Islas Vírgenes que ocurrió el 18 de noviembre de 1867. Tuvo una magnitud de unos 7.3 grados y produjo un tsunami. Este sismo se sintió con una intensidad de VI en la escala Rossi-Forel en la región de Guánica y Lajas.



1.0-sec spectral acceleration (%g) with 2% probability of exceedance in 50 years from all modeled sources.

El mapa de arriba proviene del USGS - C.S. Muller, A.D. Frankel y E.V. Leyendecker que prepararon una de las primeras versiones del "Seismic Hazard Maps for Puerto Rico and the U.S. Virgin Islands" y que necesita ser actualizado a la luz de los eventos sísmicos del año en curso en el suroeste de Puerto Rico. Muestra la aceleración sísmica que tiene 2% de probabilidad de ser excedida en los próximos 50 años, proveniente de las distintas fuentes sismogénicas que podrían afectar el área de estudio. Se presenta como ejemplo del tipo de análisis que tiene que considerar la DIA, sobre todo después de los eventos de enero pasado ,que han aumentado las probabilidades de sismos destructivos en términos de magnitud, frecuencia y peligros geológicos inducidos por terremoto.

No es el propósito de este escrito el presentar un análisis completo de las zonas sismogénicas en la región de Puerto Rico sino demostrar lo crítico que es incluir en la DIA un análisis de la amenaza que presenta la actividad sísmica en el proyecto propuesto.

El área donde se pretende ubicar al proyecto se caracteriza por el alto peligro sísmico que presentan las fallas activas del sur del Valle de Lajas, Punta Montalva y otras que se desconocían y cuya presencia fue revelada por los eventos de los últimos 10 meses. Es importante comprender que eventos sísmicos similares podrían volver a ocurrir al igual que eventos mayores aunque con probabilidad menor.

Eventos sísmicos iguales o mayores que los ocurridos el 7 de enero de 2020 deben ser evaluados y considerados con mucho rigor en la DIA así como el desplazamiento de la actividad sísmica hacia Guánica, Lajas y Cabo Rojo ya que sismos similares a los pasados ocurrirían más cerca o en la misma área del proyecto los impactos serían potencialmente mayores.

En resumen deben identificarse todas las zonas sismogénicas que pueden impactar al área del proyecto de forma significativa. Debe incluir un análisis probabilístico de la magnitud y frecuencia de los eventos sísmicos incluyendo la nueva secuencia que se inició en diciembre de 2019 que incluye directamente el área propuesta para la "Finca Solar. También se deben establecer las aceleraciones sísmicas y desplazamientos que podrían impactar el área del proyecto así como sus consecuencias.

#### **Amplificación de ondas sísmicas:**

Otro de los peligros que tienen que ser considerados es la amplificación de ondas sísmicas. Debido a que la mayor parte del proyecto está ubicado sobre depósitos aluviales que progresivamente han ido llenando el Valle de Lajas es esencial que se considere el fenómeno de amplificación de ondas sísmicas.

Esto es necesario debido a que estos lugares pueden hacer que el sismo se sienta más fuerte y que su duración sea mayor. Esto ocurre porque las ondas sísmicas reducen su velocidad y aumentan su amplitud cuando viajan a través de materiales blandos, saturados de agua y de gran espesor. En otras palabras, estos lugares tienden a vibrar más fuerte y por más tiempo que aquellos que son rocosos y rígidos por lo que los daños potenciales al proyecto podrían mayores.

Durante mucho tiempo se ha reconocido que diferentes lugares ubicados a la misma distancia epicentral experimentan grandes variaciones en la distribución de daños debido a la influencia de las condiciones geológicas locales en el movimiento del suelo.

Las características de los sedimentos aluviales, su profundidad o grosor, contenido de agua, las propiedades geotécnicas del material aluvial no consolidado, la topografía del basamento rocoso bajo el manto aluvial, la geometría de los depósitos y las rocas subyacentes pueden modificar los movimientos del suelo cambiando el contenido de amplitud y frecuencia del movimiento. Estas áreas sufren aceleraciones sísmicas mayores por lo que tiemblan más fuerte y por mayor tiempo que en lugares rocosos.

## Licuación:

De igual manera, en las áreas aluviales, donde hay materiales arenosos, de edad geológica reciente, de tamaño mediano a fino y saturados de agua puede ocurrir el fenómeno de licuación. Cuando ocurre el terreno se comporta como si fuera arena movediza haciendo que las estructuras ubicadas sobre estos se hundan parcialmente o que sufran asentamientos diferenciales a medida que el agua es expulsada a la superficie. Dicho fenómeno ocurrió en numerosos lugares costeros y aluviales en los municipios de Guánica, Lajas, Guayanilla, Peñuelas y Ponce como consecuencia de los sismos del 6 y 7 de enero del año en curso.

Cuando estos materiales arenosos experimentan el efecto de las ondas sísmicas los mismos tienden a compactarse causando un aumento en la presión del agua que satura los poros en el suelo. Esto es causado por la transferencia de carga de partículas del suelo al agua que ocupa los poros.

Ésta puede drenar hacia afuera y reducir la presión pero, si se restringe, la presión del agua en los poros puede elevarse y alcanzar una fuerza similar a la que ejerce el peso de la columna del suelo sobre la capa arenosa subyacente. En estas condiciones, durante un corto período de tiempo, el suelo podría sufrir grandes deformaciones y comportarse como un fluido en lugar de como un sólido.

Cualquier estructura, relleno o terraplén ubicado en suelo licuado sufrirá deformaciones. Estos pueden accionar flujos laterales del suelo al perder toda su resistencia a los esfuerzos cortantes. Además, pueden ocurrir asentamientos diferenciales y la expulsión de arena a la superficie. El asentamiento de arena es causado principalmente por el componente de cizallamiento horizontal del movimiento.

Las condiciones geológicas que favorecen la licuación incluyen la presencia de lentes de arena saturada y potencialmente licuable. Ésta debe ser porosa, bien diferenciada de acuerdo con el tamaño de sus partículas. Generalmente constituyen formaciones lenticulares que están confinadas por capas de baja permeabilidad. El confinamiento de agua en los poros por capas impermeables por encima y por debajo del lecho licuable, y la proximidad del lente de arena a la superficie (50 pies o menos) son factores favorables.

La licuación ocurre principalmente donde las arenas se han depositado en los últimos 10,000 años y donde el nivel freático yace a menos de 10 metros de la superficie. Es importante señalar que los depósitos de aluvión donde, está ubicado la mayor parte del proyecto, son cónsonos con estas características que favorecen la licuación.

En Puerto Rico, la licuación se observó en las tierras bajas de Rincón y Añasco durante el terremoto del 11 de octubre de 1918, donde agua y la arena fue expulsada a la superficie a través de numerosas grietas longitudinales en terrenos aluviales. Este fenómeno ocurrió en zonas donde la intensidad del terremoto (escala Rossi-Forel) fue de VII o mayor.

En resumen, los factores principales que propician la licuación incluyen temblores que produzcan intensidades mayores V o VI en la escala MMI, la presencia de materiales arenosos sueltos, de edad geológica reciente, ubicados cerca de la superficie y que

estén saturados por agua. Éstas condiciones pueden estar presentes en los terrenos aluviales del proyecto y no han sido evaluadas en la DIA.

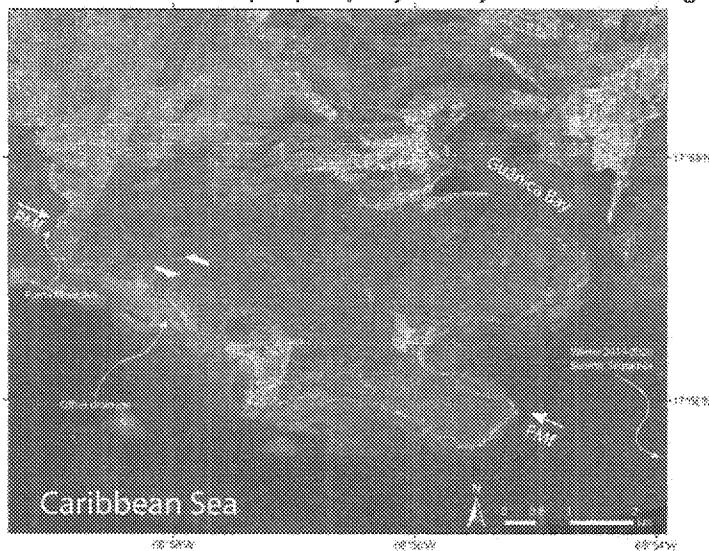
La ubicación del proyecto propuesto dentro de materiales geológicos susceptibles a la licoación del terreno así como la amplificación de ondas sísmicas sin una evaluación geotécnica detallada de los peligros potenciales, plantea una deficiencia grave en términos de los peligros geológicos inducidos por terremoto en el lugar seleccionado.

Esto es particularmente crítico luego de los terremotos de enero pasado que revelaron un grado de peligro sísmico mucho mayor que el que se tenía anteriormente. De hecho, al presente se considera que el sistema de fallas del sur del Valle de Lajas y de la falla de Punta Montalva son parte del margen de placa que bordea la micro-placa de Puerto Rico y las Islas Vírgenes.

Dentro de este contexto es muy importante evaluar el potencial de ruptura del terreno en caso de que afloren las fallas geológicas a la superficie. El sistema de la falla Punta Montalva discurre justamente al sur del proyecto. Ramificaciones asociadas a dicha falla podrían aflorar en el proyecto.

Al igual que la mayoría de los sistemas de fallas de Puerto Rico éstas se caracterizan por ser de corrimiento lateral izquierdo. Esto significa que de ocurrir un movimiento lateral a lo largo de una falla en la superficie, el área del proyecto podría desplazarse hacia el oeste, a lo largo de la parte norte de la falla, mientras la parte al sur de la falla que se movería hacia el este. Esto causaría roturas y desgarres en las instalaciones del proyecto propuesto ubicadas directamente sobre la falla.

Hay que evaluar el potencial de fallas subsuperficiales que estén ubicadas bajo el proyecto y que eventualmente puedan aflorar corto y mediano plazo durante la vida útil del proyecto. Dicha consideración requiere establecer sus consecuencias en las instalaciones del propio proyecto y cómo se mitigarían sus efectos.



Ubicación de la falla de Punta Montalva a lo largo del borde sur del proyecto "Montalva Solar Farm. Imagen tomada de "temblor" del informe de A. López referenciado al principio.

**Deficiencias en el análisis de los impactos geológicos encontrados en la Declaración de Impacto Ambiental del proyecto “Montalva Solar Farm – Guánica – Lajas” (B – DIA)**

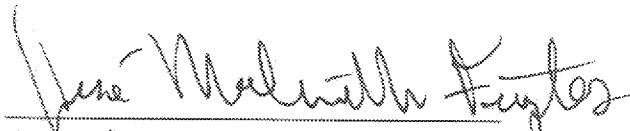
**Opinión pericial del José Molinelli Freytes Ph. D.**

**Resumen de conclusiones principales:**

1. La DIA no cumple su propio propósito, ni los objetivos de la ley que lo requiere, al no identificar, evaluar, ni considerar las implicaciones de los impactos geológicos que son críticos para éste proyecto.
2. La amenaza que presentan los peligros geológicos, fueron ignoradas en la DIA, a pesar de que deben ser parte esencial para la determinación de la viabilidad del Proyecto, en el lugar propuesto, por la seria amenaza que presentan al mismo.
3. Los peligros inducidos por terremoto son críticos para determinar la viabilidad del Proyecto y deben ser evaluados y analizados rigurosamente.
4. Éstos presentan un alto riesgo para el Proyecto debido a que pretenden ubicarlo en el mismo margen tectónico de la micro-placa de Puerto Rico e Islas Vírgenes con la placa del Caribe. A lo largo del mismo hay sistemas de fallas geológicas activas como la del Sur del Valle de Lajas y la de Punta Montalva en Guánica que discurren por la porción sur del Proyecto. Esto significa que el Proyecto puede estar expuesto al efecto de terremotos fuertes muy cercanos y hasta en el Proyecto mismo.
5. Otras fallas, desconocidas hasta el momento se han activado tanto en la parte terrestre como marina de los municipios Lajas, Guánica, Guayanilla, Peñuelas y Ponce.
6. El margen tectónico está muy activo, en pleno desarrollo y ha producido miles de sismos durante los últimos diez meses. Los más fuertes de 5.7, 5.8 y 6.4 se han sentido fuertemente a través de toda la Isla siendo muy destructivos en la región suroeste, particularmente entre Lajas y Ponce. En Guánica y Guayanilla los daños fueron mayores causando daños de diverso grado incluyendo serias afectaciones estructurales y hasta el colapso de escuelas, centros gubernamentales, Iglesias, comercios, viviendas, carreteras y autopistas y plantas de generación de energía entre otros.
7. Pueden haber eventos similares o más fuertes en esta región por lo que la DIA deberá considerar los escenarios más críticos “worst case scenario” para el Proyecto.
8. Esto conlleva la determinación de la aceleración, duración, magnitud y frecuencia de eventos sísmicos que pueden impactar el área del Proyecto desde distintas fuentes sismogénicas.
9. Específicamente los terremotos, no solo pueden causar daños por las vibraciones que producen sino que pueden causar la licuación del terreno y amplificar las ondas sísmicas de acuerdo a las características de los depósitos aluviales que nunca fueron determinadas y evaluadas en la DIA.
10. La licuación es común en los terrenos aluviales (Qa) como los que ocupan la mayor parte del Proyecto. Éstos pueden tener lentes de arena, de tamaño mediano a fino,

estar saturadas por agua y tener poca cohesión por lo que durante un sismo pueden fluidizarse haciendo que el terreno pierda su capacidad de carga y se convierta en algo similar a la arena movediza. Esto podría causar asentamientos diferenciales en el terreno y hundimientos de porciones de las instalaciones del sistema propuesto.

11. La amplificación de ondas sísmicas es característica de terrenos aluviales profundos, saturados por agua y constituido de materiales no consolidados como el "Qa" que domina el área del Proyecto. Estos materiales geológicos reducen la velocidad de las ondas sísmicas al disminuir la longitud y aumentar su amplitud. Esto causa que los terrenos vibren más fuerte y por más tiempo incrementando el potencial de daño a la infraestructura allí ubicada.
12. Otro peligro significativo es el potencial de ruptura y desplazamiento diferencial de la superficie del terreno como consecuencia del afloramiento de una falla geológica en el área del Proyecto. El epicentro de gran número de sismos ha ocurrido a pocos kilómetros de la superficie y hay que evaluar dicho potencial dentro del Proyecto por su ubicación en el margen de placa y la activación de nuevas fallas subsuperficiales que eran desconocidas hasta el presente. De ocurrir dicha ruptura porciones del Proyecto pueden desplazarse lateral o verticalmente en direcciones opuestas causando rupturas y desgarres en las estructuras e instalaciones del Proyecto.
13. La información geológica, que contiene la DIA, presenta información limitada a dos páginas. Solamente es de carácter descriptivo y está mal traducida del mapa del mapa del que provino. No considera las implicaciones que pueda tener dicha geología en el proyecto. El mapa geológico se limita solo al área específica del proyecto excluyendo la geología circundante como si lo considerara un sistema aislado que no interactúa con el ambiente geológico aledaño.
14. Dado el alto nivel de peligro sísmico del área donde se quiere ubicar el Proyecto es inconcebible que no se mencione en la DIA. La consideración rigurosa y detallada de estos peligros es indispensable para cumplir con los requisitos de la DIA.
15. Al no considerar los peligros geológicos pone en riesgo no solo la inversión de \$250 millones sino la funcionalidad de las áreas industriales, comerciales, residenciales y de servicio que serán servidas por la energía que aquí se genere.

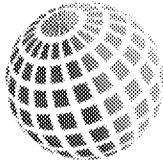


Preparado por José Molinelli Freytes Ph.D.

Geomorfólogo

29 de octubre de 2020

## **Exhibit 2**



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October 13, 2021

Deanne Criswell  
FEMA Administrator

Brenda Mallory  
Council on Environmental Quality

Gina McCarthy  
White House National Climate Advisor

Gretchen Sierra-Zorita  
White House Office of Intergovernmental Affairs

Cc: Congressman Grijalva and members of the House Natural Resources Committee

To Whom It May Concern:

I am writing to express my concern with the pending use of billions of dollars of FEMA funds for Puerto Rico's electrical system. Puerto Rico's plan is bad economic and fiscal policy and makes a mockery of the Biden administration's climate policy goals of decarbonizing the nation's electricity sector by 2035.

The Puerto Rico government has proposed a 10-year plan to use over \$14 billion in FEMA funds to rebuild essentially the same centralized grid that failed during Hurricane Maria. The plan earmarks \$0 of federal funds for renewable energy. The CEO of PREPA testified to Congress on October 6<sup>th</sup> in support of using federal funds for new imported liquefied natural gas (LNG) projects.

Professional technical studies support the rapid deployment of rooftop solar and storage as the best way to provide resiliency to households, dramatically reduce the island's dependence on fossil fuels, and lower and stabilize electric rates – at a lower capital cost than the poorly designed plan made by PREPA, the Island's utility.<sup>1</sup> The Puerto Rico Energy Bureau has also questioned the level of proposed transmission and distribution system spending by PREPA. PREPA never showed that its proposed investments in system hardening were cost-effective

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<sup>1</sup> Vila Biaggi, Kunkel and Irizarry Rivera. We Want Sun and We Want More. March 2021; EE Plus. Puerto Rico Distribution Modeling. March 2021; Energy Futures Group. Puerto Rico Distributed Energy Resource Integration Study. February 2021; Telos Energy. Puerto Rico Distributed Energy Resource Integration Study. December 2020.

relative to other alternatives.<sup>2</sup> The sad history of spending billions and having nothing to show for it in Puerto Rico is about to be repeated.

Since 2018 PREPA and the Financial Oversight and Management Board (FOMB)<sup>3</sup> have identified an expansion of renewable energy as the linchpin to Budget balance for the authority. The current fuel budget made up of coal, oil and natural gas must be replaced or Puerto Rico's economy will continue to be held captive to market volatility and price spikes. This year alone price spikes in natural gas and oil have driven four electric rate increases.

Puerto Rico's current path of rebuilding the centralized grid and privatizing the island's power plants will prolong the island's dependence on fossil fuels, which is the leading cause of rising electric rates. Four years after Hurricane Maria, Puerto Rico continues to generate more than 95% of its electricity from fossil fuels; although the transition to renewable energy has been identified in formal budget and energy plans as a central part of the solution, next to no progress has been made. The federal funds available in this moment represent the best, and only, opportunity for Puerto Rico to realize this vision. I urge your offices to work together to ensure that this opportunity is not wasted.

I have been in and around government program and finances since the 1970's. If this plan goes forward in its current form Puerto Rico is guaranteed a newly built, poorly equipped and outdated grid, a permanent fiscal crisis and rising electricity rates.

Sincerely,

A handwritten signature in black ink, appearing to read "Tom Sanzillo".

Tom Sanzillo  
Director of Financial Analysis  
Institute for Energy Economics and Financial Analysis  
[tsanzillo@ieefa.org](mailto:tsanzillo@ieefa.org)

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<sup>2</sup> Puerto Rico Energy Bureau. Final Resolution and Order. Case No. CEPR-AP-2018-0001. August 2020. P. 229.

<sup>3</sup> (FY 2018 p. 52)

## **Exhibit 3**

U.S. House of Representatives  
Committee on Natural Resources  
Washington, DC 20515

October 25, 2021

Deanne Criswell  
Administrator  
Federal Emergency Management Agency (FEMA)  
500 C St SW  
Washington, DC 20024

Dear Ms. Criswell,

Puerto Rico is currently experiencing an energy crisis with life-threatening consequences for its more than three million residents. Despite paying nearly twice as much for electricity compared to stateside residents, Puerto Ricans continue to be burdened by regular power outages and other service disruptions due to the territory's fragile and mismanaged electrical infrastructure.<sup>1</sup> As you know, more than \$9.4 billion in federal recovery funds have been assigned by the Federal Emergency Management Agency (FEMA) to rebuild Puerto Rico's power grid following a series of natural disasters in recent years.<sup>2</sup> However, residents and elected officials in Puerto Rico have expressed concerns that current plans to utilize these funds fail to invest in renewable energy alternatives like rooftop solar and battery storage, which experts have found could significantly increase Puerto Rico's generation potential and help offset the currently unstable grid.<sup>3</sup> I am requesting that FEMA, as the entity responsible for providing these funds and reviewing proposals so that they meet standards set by federal and local law, commit to working with all relevant parties to direct federal funds towards expanding Puerto Rico's rooftop solar and battery storage capacities at amounts sufficient for meeting the goals outlined in the "Puerto Rico Energy Public Policy Act."

In an effort to decrease Puerto Rico's reliance on imported fossil fuels to generate electricity and increase its share of cleaner renewable energy, Puerto Rico's legislature enacted the "Puerto Rico Energy Public Policy Act" in May of 2019.<sup>4</sup> This law, in part, requires increasing the percentage of the island's energy that is generated by renewable sources to 40% by 2025, 60% by 2040, and

<sup>1</sup> U.S. Energy Information Administration (EIA). *Puerto Rico Territory Energy Profile*.

<https://www.eia.gov/state/print.php?sid=PR>. Updated October 21, 2021. According to the EIA, the average cost in cents/kWh in Puerto Rico compared to the United States was about 1.45 times higher for "Residential" electricity, about 1.93 times higher for "Commercial" electricity, and about 2.37 times higher for "Industrial" electricity for the July 2021 period.

<sup>2</sup> Federal Emergency Management Agency (FEMA). *FEMA Explains Processes for Island's Power Grid Projects*. Sept. 22, 2021. <https://www.fema.gov/press-release/20210922/fema-explains-processes-islands-power-grid-projects>

<sup>3</sup> Sigrin, Ben, and Mooney, Meghan. *Rooftop Solar Technical Potential for Low-to-Moderate Income Households in the United States*. National Renewable Energy Laboratory. NREL/TP-6A20- 70901. 2018.

<https://www.nrel.gov/docs/fy18osti/70901.pdf>.

<sup>4</sup> See: "Puerto Rico Energy Public Policy Act" [Act. No. 17 of April 11, 2019]. Office of Management and Budget, Government of Puerto Rico. <https://bvirtualogp.pr.gov/ogp/Bvirtual/leyesreferencia/PDF/2-ingles/17-2019.pdf>.

100% by 2050.<sup>5</sup> However, Puerto Rico's current energy production falls far short of even the lowest and nearest of those goals. In fiscal year 2020, only 2.3% of Puerto Rico's electricity came from renewable sources, including just 1.4% from solar.<sup>6</sup>

Despite a clear need for significant and immediate investment in renewables to meet Puerto Rico's energy goals, recent actions from island authorities have impeded such investments. For example, the Financial Management and Oversight Board (FOMB) of Puerto Rico recently rejected 16 utility-scale solar energy projects.<sup>7</sup> The Puerto Rico Electric Power Authority (PREPA) claimed this decision was "unjust" and would result in the "deterioration of the working relationship" between the organizations.<sup>8</sup> However, PREPA's own 10-Year Infrastructure Plan initially failed to reserve federal funds for bolstering renewable energy and storage, and instead called for these funds to be put towards hardening the centralized grid and developing new natural gas infrastructure.<sup>9</sup> Although PREPA intends to solicit more bids for projects focused on renewables, this process has been repeatedly delayed.<sup>10</sup>

These decisions and delays have hindered Puerto Rico's ability to transform its electrical system and are in direct opposition to President Biden's objective to invest in clean energy and promote environmental justice nationally.<sup>11</sup> According to a March 2021 report, achieving 75 percent distributed renewable energy generation in 15 years is possible by equipping all Puerto Rican homes with 2.7 kW photovoltaic panels and a 12.6 kWh battery backup, in addition to solar installations at commercial sites like parking lots.<sup>12</sup> Doing so would not only cut imported fossil fuel costs from approximately \$1.4 billion annually to \$430 million annually, but it could also

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<sup>5</sup> SB 1121 Puerto Rico Energy Public Policy Act, p. 23, accessed August 2021. The law also requires the closing of all coal-fired electrical generation by 2028.

<sup>6</sup> U.S. Energy Information Administration (EIA). *Puerto Rico: Territory Profile and Energy Estimates*. <https://www.eia.gov/state/analysis.php?sid=RQ>. Updated November 19, 2020. According to the EIA, only 0.3% of Puerto Rico's electricity came from solar power in fiscal year 2015, making it the fastest-growing source of renewable energy in Puerto Rico. Puerto Rico also has 19 hydroelectric generating plants, but electricity generation varies significantly from them and some are more than 100 years old.

<sup>7</sup> Financial Management and Oversight Board. Public Meeting Documents. *Selection of 150MW of renewable, non-operational PPOAs*. Feb. 26, 2021.

<sup>8</sup> Fajardo, Rosario. *FOMB and Prepa Clash Over Renewable Energy Agreements*. The Weekly Journal. Aug. 26, 2020. [https://www.theweeklyjournal.com/business/fomb-and-prepa-clash-over-renewable-energy-agreements/article\\_5aa49532-e71a-11ea-8ebc-47ff7e65c17e.html](https://www.theweeklyjournal.com/business/fomb-and-prepa-clash-over-renewable-energy-agreements/article_5aa49532-e71a-11ea-8ebc-47ff7e65c17e.html)

<sup>9</sup> Puerto Rico Electric Power Authority (PREPA) & Federal Emergency Management Agency (FEMA). *PREPA 10-Year Infrastructure Plan*. Updated March 2021. [https://acepr.com/es-pr/Documents/20201207\\_PREPA%2010-Year%20Infrastructure%20Plan\\_vF.pdf](https://acepr.com/es-pr/Documents/20201207_PREPA%2010-Year%20Infrastructure%20Plan_vF.pdf)

<sup>10</sup> Government of Puerto Rico, Public Service Regulatory Board, Puerto Rico Energy Bureau (PREB). *Request for Extension of Time to File Updated Procurement Plan Required by December 8, 2020 Resolution and Order*. Apr. 30, 2021. <https://energia.pr.gov/wp-content/uploads/sites/7/2021/03/Request-of-the-PREPA-for-Extension-of-Time-to-Fi.pdf>

<sup>11</sup> The White House. Presidential Actions. *Executive Order on Tackling the Climate Crisis at Home and Abroad*. Jan. 27, 2021.

<https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>

<sup>12</sup> M. Vila Biaggi, Ingrid. Kunkel, Cathy. A. Irizarry Rivera, Agustín. *We Want Sun and We Want More: 75% Distributed Renewable Generation in 15 Years in Puerto Rico Is Achievable and Affordable*. CAMBIO PR & Institute for Energy Economics and Financial Analysis (IEEFA). March 2021. p. 2. [https://ieefa.org/wp-content/uploads/2021/03/We-Want-Sun-and-We-Want-More\\_March-2021.pdf](https://ieefa.org/wp-content/uploads/2021/03/We-Want-Sun-and-We-Want-More_March-2021.pdf)

bring the total system cost down to 15 cents/kWh by 2035.<sup>13</sup> However, the report notes that this progress is only possible when supported by federal funds, like the \$9.4 billion assigned by FEMA to upgrade and modernize Puerto Rico's power grid.

As was discussed at an oversight hearing hosted by the House Committee on Natural Resources on October 6, 2021, committing these funds for renewable energy sources like rooftop solar would also reduce the existing gap in access to solar between high- and low-income households in Puerto Rico.<sup>14</sup> A December 2020 report found that low-to-moderate income households, which make up 50% of the local population, spend disproportionately more on energy but are less likely to adopt solar compared to higher-income households.<sup>15</sup> The report also found that Puerto Rico has 435% more rooftop generation potential than electric consumption among all residential buildings, and 570% more generation potential among low-to-middle income buildings exclusively.<sup>16</sup> Policies that further consider and address these inequities in access to rooftop solar among residents of varying income levels are needed, but immediate progress can be made through the largescale use of federal funds to finally take advantage of Puerto Rico's significant rooftop solar and storage potential.

Additionally, the Committee applauds the recent decision from FEMA and the Department of Energy (DOE) to carry out a study to examine methods for achieving Puerto Rico's goal of building an energy system entirely based on renewables. This study is an answer to requests from many interest groups on the island engaged in resolving Puerto Rico's energy troubles and its findings will be extremely valuable to the objective of transforming Puerto Rico's energy system. I encourage FEMA and DOE to provide ample focus to the benefits of rooftop solar and battery storage within the scope of this study and I reiterate the importance of utilizing federal funds from FEMA to develop and expand these renewable energy sources.

Puerto Rico requires immediate action to mitigate its energy crisis. It is unacceptable that consumers are forced to endure recurring blackouts and increased rates while the bureaucracy that operates Puerto Rico's electrical infrastructure continues to delay and deter progress on building a new system that harnesses the island's massive potential for renewables. I respectfully request that FEMA help us realize a new energy future for Puerto Rico by ensuring that the funds reserved for upgrading the power grid include robust and specific investments in rooftop solar and storage at levels that facilitate 40% generation from renewables by 2025 and, ultimately, 100% renewable generation by 2050.

Thank you for considering this request and I welcome the opportunity to engage with you and others further on this subject. Please contact Ivan Robles with the Committee's Office of Insular

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<sup>13</sup> Ibid, p. 17.

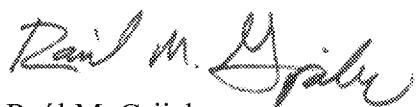
<sup>14</sup> House Committee on Natural Resources, 117<sup>th</sup> Congress. House Committee Hearing. *Puerto Rico Electric Power Authority (PREPA) Post-Implementation of the LUMA Transmission and Distribution Contract*. Oct. 6, 2021. <https://www.congress.gov/event/117th-congress/house-event/114107>

<sup>15</sup> Sigrin, Ben, and Mooney, Meghan. *Rooftop Solar Technical Potential for Low-to-Moderate Income Households in the United States*. p. 2. <https://www.nrel.gov/docs/fy18osti/70901.pdf>.

<sup>16</sup> Ibid, p. 12.

Affairs at [Ivan.Robles@mail.house.gov](mailto:Ivan.Robles@mail.house.gov) or 202-794-0961 if you have any questions about this request.

Sincerely,



Raúl M. Grijalva  
Chair  
House Committee on Natural Resources